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INTESTINAL NODULES IN CHICKENS DUE TO HETERAKID LARVÆ (HETERAKIS BERAMPORIA LANE)

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ONE PLATE

INTRODUCTION

In the course of post-mortem examinations of chickens (*Gallus domesticus*) in Los Baños, Laguna Province, Philippine Islands, I frequently found nodules in the wall of the cæca associated with the presence of adult heterakids in the lumen. Nodules from different host animals were dissected at various times and in practically all cases nematode larvæ were found in them, a single larva having been found in each nodule. The larvæ were very active in physiological salt solution in which they performed wriggling movements for some time after their liberation from the nodules.

Recent examination of the adult heterakids obtained from chickens containing cæcal nodules showed that the parasites in question agree with the description of *Heterakis beramporia* Lane, 1914, to which species they doubtless belong.

[1] The note on Microscopic Findings is by Robert J. Formad, pathological division, Bureau of Animal Industry, United States Department of Agriculture.

LANE'S DESCRIPTION OF HETERAKIS BERAMPORIA

Lane gives the following description of *Heterakis beramporia*:

Œsophagus, 0.745 millimeter long; first part, 0.045 millimeter; second part, 0.5; third part, 0.2. Nerve collar, 0.225 millimeter; cervical papillæ, 0.38 from cephalic end. Excretory pore, 0.35 from cephalic end.

Males straight with the exception of a curve, dorsad, at head end; 5.5 millimeters long by 0.24 wide. Sucker circular, 0.055 millimeter in diameter. Spicules of nearly equal length but different in shape, the right spicule 0.35 millimeter long, with a tapering point, and the left spicule 0.3 long, expanding "in its peripheral third" and bearing near the point a prominent angle on its ventral aspect.

Females are 6.6 millimeters long, with a maximum diameter of 0.03, and have a dorsad cephalic curve, and at about the level of the vulva they somewhat abruptly start a curve, ventrad. Vulva opens practically at equator, a valvular flap projecting cephalad over the opening. The anus is 0.66 millimeter from the tip of the tail.

The worms were collected by Lane from the cæca of domestic fowls in Berhampore, Bengal, India. Lane states that these parasites produce no lesions of the cæcal wall so far as his experience goes.

In view of the fact that I found pronounced nodules in the wall of the cæca of chickens harboring the adult parasites, I made a careful comparison of my specimens with Lane's description of *Heterakis beramporia*, with a view to discovering possible differences, and obtained the following results:

MY OBSERVATIONS ON HETERAKIS BERAMPORIA FROM THE PHILIPPINES

Male.—The male is from 5.2 to 5.5 millimeters long by 0.25 in maximum width, in the region at the base of the œsophagus. The diameter of the body immediately below the lips is 0.05 millimeter. It is curved in outline with a curve, dorsad, at the head end. Plate 1, fig. 1, shows an outline drawing of a male and a skeleton outline drawing of another specimen; the latter is decidedly sinuous in outline. According to Lane the males are straight with the exception of the curve, dorsad, at the head end. I have not found any males corresponding to that description. While the curve, dorsad, at the head is undoubtedly a diagnostic character of this species, the curvature of the rest of the

body is dependent upon the state of contraction of the worm at the time it is killed and is, in my opinion, without significance. The œsophagus is 0.63 millimeter long and 0.12 to 0.15 wide at the bulb. The first part of the œsophagus measures 0.034 millimeter; the last part, 0.18. The nerve collar is 0.205 millimeter from the cephalic extremity, and the excretory pore is 0.33 millimeter from the same point. The cervical papillæ are located 0.345 millimeter from the cephalic extremity.

The sucker (Plate 1, fig. 2) is circular and varies from 0.058 to 0.064 millimeter in diameter. The distance from its caudal end of the cloacal opening is 0.12 millimeter and thence to the last papilla 0.18. The distance from the last papilla to the tip of the tail is 0.2 millimeter. These measurements agree closely with those given by Lane. The papillæ show the same arrangement as indicated in Lane's Plate 75, fig. 1. Their arrangement as seen in lateral view is shown somewhat diagrammatically in Plate 1, fig. 3. The spicules are nearly equal in length, and in my specimens the anterior end of the left spicule is at least 0.14 millimeter posterior to the anterior end of the right spicule, the latter terminating in the region of the cloaca and the former being extruded through the cloacal aperture. The left spicule bears a prominent angle on its ventral aspect. The right spicule has a long tapering point. The lengths of the spicules are as follows: Right spicule, 0.35 millimeter; left spicule, 0.3 (Plate 1, fig. 7).

Female.—The females have a cephalic curve, dorsad (Plate 1, fig. 6); the curvature of the rest of the body is variable. Several measured specimens were found to vary from 6.3 to 6.7 millimeters in length, and the maximum width, measured in the region of the base of the œsophagus or somewhat behind that region, varies from 0.225 to 0.26 millimeter; the maximum width observed in any female was about 0.28. The diameter of the body immediately below the lips varies from 0.05 to 0.06 millimeter; in the region of the vulva, from 0.2 to 0.22.

In one specimen the nerve ring is located 0.225 millimeter from the cephalic extremity and in another 0.242 from that point. The excretory pore is located 0.345, 0.326, and 0.309 millimeter, respectively, from the head end in three different specimens. The cervical papillæ are located about 0.03 millimeter posterior to the excretory pore (Plate 1, fig. 5).

The length of the œsophagus varies from 0.68 to 0.72 by 0.12 to 0.15 millimeter in its maximum width at the bulb. The first

part of the œsophagus is 0.43 millimeter long and the last part is from 0.18 to 0.2 millimeter long. The vulva is located somewhat posterior to the equator of the body. In three specimens the ratio of the part of the body anterior to the vulva to that posterior to the vulva was found to be as follows: 352 : 296; 339 : 320; 348 : 279. Immediately caudad of the vulva is a cuticular flap which projects over the opening (Plate 1, fig. 4). The distance from the anus to the tip of the tail is from 0.067 to 0.068 millimeter.

The ova measure 0.05 to 0.06 by 0.25 to 0.03 millimeter. Lane's measurements for the ova are 0.05 by 0.03.

Allowing for individual variations, the specimens of *Heterakis* from the Philippine Islands agree in all respects with Lane's description of *Heterakis beramporia* and it must, therefore, be concluded that this species is capable of producing serious injuries to the cæcal wall, although in Lane's experience in India no lesions were observed.

CÆCAL NODULES IN BIRDS DUE TO HETERAKIDS, OBSERVED BY VARIOUS WRITERS

According to Lucet and Henry (1911), Klee (1891) first noted intestinal nodules in pheasants, and Railliet and Lucet (1892) described this condition in pheasants as a verrucose typhlitis. Railliet and Lucet found small heterakids in the mucosa of pheasants and noted a marked dilatation of the cæcum of affected birds. These writers considered the worms in question to be *Heterakis papillosa* (= *Heterakis gallinae*). This condition in pheasants was noted later by Galli-Valerio (1896), Klee (1897), Letulle and Marotel (1901) who described the pathology of these nodules, and Sambon (1908). Lucet and Henry (1911) state that, although previous writers considered *Heterakis gallinae* to be the cause of intestinal nodules in pheasants, the specific determination of the parasite was found to be faulty in the cases that they reëxamined; namely, those of Railliet and Lucet (1892), Letulle and Marotel (1901), and Sambon (1908). In these, as well as in the cases of verrucose typhlitis in pheasants described by them, the parasite in question, according to these writers, is *Heterakis isolonche* von Linstow, and it would appear that references in the literature to *Heterakis gallinae* as a cause of intestinal nodules in birds is probably due to misidentification of the parasite. The cases described by Lucet and Henry are very interesting in as much as these writers

record not only larval worms in cæcal and intestinal nodules of pheasants but also adult forms, including egg-laying females.

Recently I had an opportunity to examine portions of cæca from a pheasant that were forwarded to the zoölogical division of the United States Bureau of Animal Industry in March, 1921, by Dr. Fred Boerner, of the Pennsylvania Department of Agriculture. Doctor Boerner stated that the pheasant was autopsied in his laboratory and that—

> no definite cause for the death was found unless it be the condition of the cæca. These showed throughout their entire length nodules such as are in evidence in the samples submitted, and in each of the nodules that was opened there was found a worm. Worms were also present in the lumina of the cæca.

In the material submitted by Doctor Boerner numerous nodules were clearly visible through the serous coat; the nodules were very close together in certain portions of the cæcal walls. Several of these nodules were opened and a worm was extracted from each nodule, apparently fully grown but sexually immature, since no eggs were found in any of several female specimens that were examined. These worms correspond to the description of *Heterakis isolonche* von Linstow, a species that has not heretofore been reported from the United States.

The nodules from the cæca of pigeons are not only more numerous and more closely crowded together but also larger and far more conspicuous than those that I found in the cæca of chickens infested with *Heterakis beramporia.* The discrepancy in size of the nodules, due to the fact that two different species of *Heterakis* were represented, may be accounted for by the fact that *Heterakis isolonche* develops to a far larger size in the nodules than does *Heterakis beramporia,* since the larvæ of the latter species isolated from nodules were always microscopic in size.

In the light of our present knowledge it may be concluded that *Heterakis isolonche* von Linstow is the agent responsible for nodule formation in pheasants and that the only other species of *Heterakis* thus far known to be capable of causing nodules in birds is the species dealt with in this paper; namely, *Heterakis beramporia.* No definite nodule formation due to *Heterakis gallinae* has been recorded, although recent investigations on the life history of this parasite show that in its larval stages it has decided tissue-invading powers, and that the adults occasionally push the anterior part of the body into the intestinal

mucosa. Thus, Graybill (1921) found larvæ of *Heterakis gallinae* in the wall of the cæcum, although he failed to find any evidence of encystment. Uribe (1922) found that larval *Heterakis gallinae* migrate into the cæcal glands and, from the second to the fifth day after feeding ripe embryonated eggs to chicks, no larvæ were found in the cæcal contents, although many were present in the scrapings of the mucosa. This writer found that after the fifth day the larvæ leave the crypts of the cæcal mucosa and develop in the lumen of the cæcum.

On the basis of our present knowledge we may distinguish three stages in tissue-invading powers in worms belonging to the genus *Heterakis*, namely: (*a*) invasion by early-stage larvæ of the cæcal glands for short periods without nodule formation, *Heterakis gallinae;* (*b*) invasion of the cæcal wall by larvæ with nodule formation, *Heterakis beramporia;* and (*c*) invasion of the cæcal wall by larvæ with nodule formation and development of the worms up to the adult stage in the nodules, *Heterakis isolonche.*

MICROSCOPIC FINDINGS [2]

Before describing the actual findings it may be of interest to consider the salient points in the structure of the cæca, where the parasitic infestation was observed. The fowl has two tubular cæca extending forward from their point of origin at the junction of the small and the large intestines. The average length is about 76 or 88 millimeters. The coats are the same as in the small intestine; namely, mucosa, submucosa, muscularis, and fibrous or serous coat. The walls are relatively thin and nearly semitransparent in the normal state, so that the intestinal contents can be made out if the walls are not hypertrophied from inflammation. Lymphoid tissue is usually present in the follicular form and less frequently in the diffused form or the diffused form combined with the follicular. It is generally located in the mucosa, often sinking into the submucosa and very rarely minute follicles may be found between the two inner circular and outer longitudinal muscular coats.

It is well known that the cæca of young chickens are frequently the starting point of coccidial infection and certain inflammatory conditions. The inflammatory changes are invariably confined to the mucosa and submucosa of the two coats which have the rich blood supply and the principal accumulation

[2] By Robert J. Formad.

of lymphoid cells. The loose grouping of the lymphoid cells favors their mobility and offers a receptive soil for irritants to manifest their action.

The following conditions were observed on microscopic examination: The mucosa and submucosa were but slightly altered, consisting principally in an inconspicuous increase of lymphoid tissue. The follicles were somewhat hypertrophied and increased numerically. The principal changes were observed in the muscular coats. The intermuscular follicles were ordinarily very small clusters of lymphoid cells supported by a fine adenoid reticulum and surrounded by a thin connective-tissue capsule. The individual cells in the follicle were round and uniform in size, and they stained well with nuclear dyes. At the ends of the oblong patch the follicular masses could be made out here and there, but in the middle of the patch the cell mass had become so large that it appeared to be formed from the fusion of several follicles or the development of diffused adenoid tissue as the result of an irritant causing the cell proliferation, resulting in the blending with the follicles. The capsule was more pronounced, the original lymphoid cells were increased in size, had become irregular in shape, granular in appearance, and stained very poorly, indicating degenerative changes. Between the cells granular material had accumulated, resulting from disintegration of cells. Channels (spaces) were formed from the liquefaction and subsequent absorption of the degenerated material. In places eosinophiles were present. As eosinophiles often accompany parasitic affections, a systematic search in all the nodules in the serial sections was undertaken, which resulted in finding in some preparations that came near the end of the patch round and oval structures which proved to be transverse and oblique sections of larval worms, and sections from the central part of the patch showed longitudinal sections of a larval parasite (*Heterakis beramporia*).

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ILLUSTRATION

PLATE 1. HETERAKIS BERAMPORIA LANE

FIG. 1. Male and skeleton outline of a male specimen. (Original.)
2. Preanal sucker. (Original.)
3. Posterior end of male, somewhat diagrammatic. Ventral papillæ of the paracloacal group not shown in this view. (Original.)
4. Vulva, with projecting cuticular flap. (Original.)
5. Anterior portion of female; *cp*, cervical papilla; *exp*, excretory pore; *int*, intestine; *lp*, lip; *n*, nerve ring; *oes*, œsophagus. (Original.)
6. Female and skeleton outlines of two other females; *a*, vulva; *b*, anus; *c*, termination of œsophagus. (Original.)
7. Spicules. (Original.)

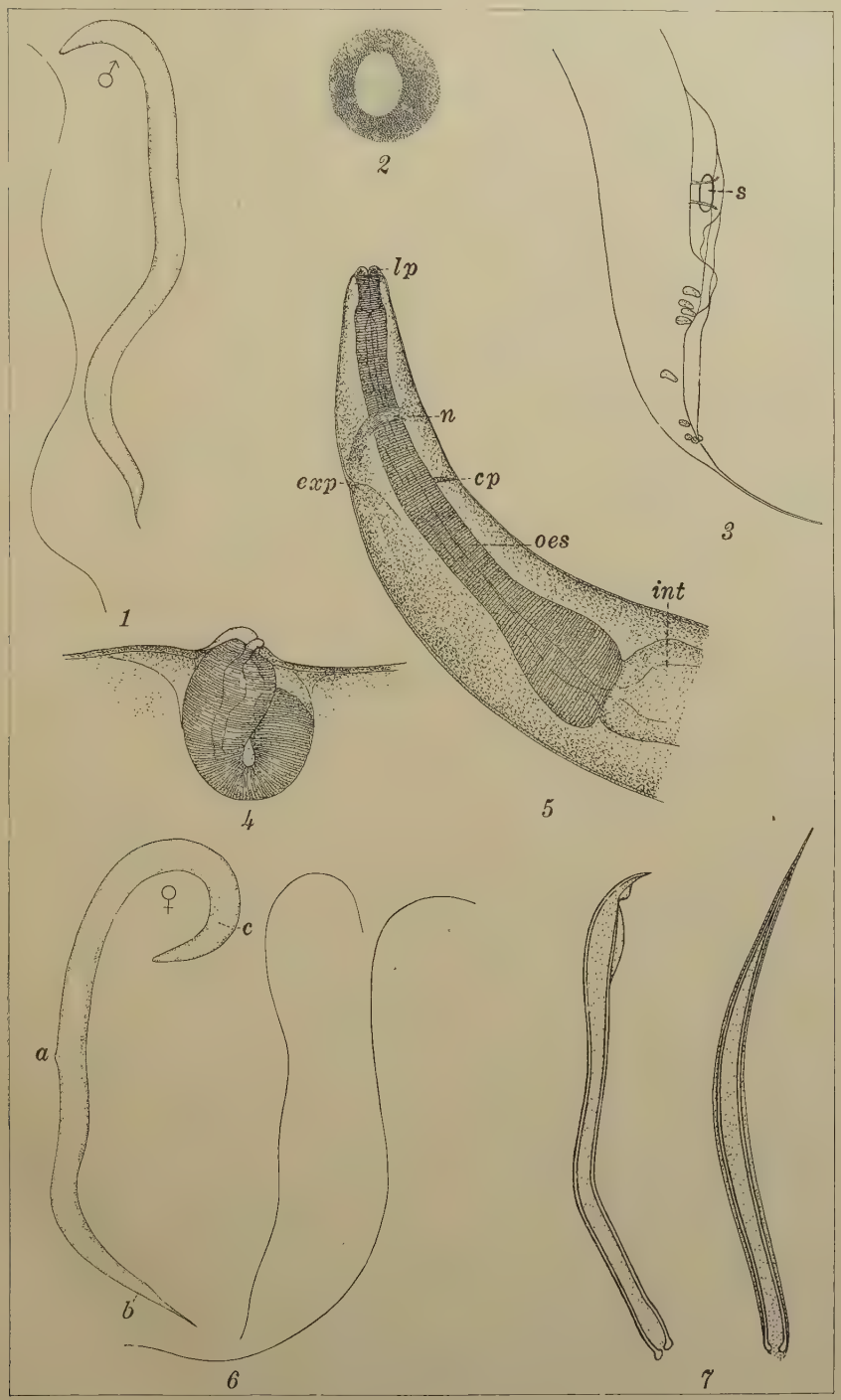

PLATE 1.

METAZOAN PARASITES OF PHILIPPINE DOMESTICATED ANIMALS

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THREE PLATES AND TWO TEXT FIGURES

The parasitic worm fauna of domesticated animals in the Philippine Islands is very incompletely known. In fact, aside from the publications of Schwartz,(19, 20, 21, 22) Boynton,(4) Boynton and Wharton,(5) Wharton,(26, 27) and of a few other American investigators who have had opportunities to examine material through sendings for identification, there is scarcely any Philippine literature that deals with this important field of zoölogical research. The situation is unfortunate; more attention should be paid to parasites and parasitic diseases, for the reasons that parasites are of common occurrence and that native animals often suffer from their injurious effects.

The object of this paper is to record some parasitic worms that I have been able to identify from the helminthological collection of the College of Veterinary Science, University of the Philippines. These and other parasites, which have been previously reported by other writers, are found in the list given in this paper, which includes a total of eighty-one species. Five of these are new to science and are described in detail. The others are simply mentioned by giving what are considered their most nearly valid names.

The list is rather incomplete at present, especially as to the parasites of cattle, carabaos, sheep, and goats, owing to the scanty material at hand from these hosts.

Unless otherwise stated, the parasites dealt with in this paper were collected in Los Baños, Laguna Province, Luzon.

I desire to record my thanks to the following, whose interest or influence has aided in the accumulation of the helminthological collection at my disposal: Dr. Benjamin Schwartz, formerly of the University of the Philippines, Los Baños; Dr. C. H. Schultz and Dr. A. K. Gomez, of the College of Veterinary Science, University of the Philippines; Dean C. F. Baker and

Dr. B. M. Gonzalez, of the College of Agriculture, University of the Philippines; and Dr. Stanton Youngberg and Dr. Vicente Ferriols, of the Philippine Bureau of Agriculture.

Technic.—The presence of a large amount of moisture in the air during the greater part of the year in the Philippines renders the infiltration of nematodes with glycerine difficult and arduous. For this reason the Carnoy-phenol mixture recently recommended by Hetherington(13) was tried, and it has been found to give very satisfactory results. The method is quick and can be carried out under moist atmospheric conditions.

PLATYHELMINTHES

TREMATODA

FASCIOLIDÆ

FASCIOLINÆ

Genus **FASCIOLA** Linnæus, 1758

Fasciola hepatica Linnæus, 1758.

Hosts: Cattle, carabao, sheep, and goat.

Location: Bile ducts.

Localities collected: Manila, Laguna, Pampanga, and Occidental Negros.

Fasciola gigantica Cobbold, 1856.

Hosts: Cattle, carabao, sheep, and goat.

Location: Bile ducts.

Localities collected: Manila and Occidental Negros.

FASCIOLOPSINÆ

Genus **FASCIOLOPSIS** Looss, 1899

Fasciolopsis sp.

Host: *Bos* (*taurus*?).

Location: Intestine?

Locality collected: Manila?

I have not yet encountered this parasite in my post-mortem work. According to Garrison,(9) specimens of this worm were forwarded by the Philippine Bureau of Science to the United States Naval Medical School helminthological collection, where they bear the catalogue No. 142.

OPISTHORCHIIDÆ

OPISTHORCHIINÆ

Genus **OPISTHORCHIS** (R. Blanchard, 1895)

Opisthorchis felineus (Rivolta, 1884).

Host: *Felis catus* (*F. domestica*).
Location: Bile ducts?
Locality collected: Manila?

Garrison(9) states that specimens of this parasite sent by the Bureau of Science are listed under catalogue No. 144 of the United States Naval Medical School helminthological collection. The breed of the host animal is not known. If the specimens were obtained from a native cat, it is possible that they are identical with the next species.

Opisthorchis wardi Wharton, 1921.(27)

Host: Domestic cat.
Location: Bile ducts.
Locality collected: Manila.

DICROCOELIIDÆ

DICROCOELIINÆ

Genus **DICROCOELIUM** (Dujardin, 1845)

Dicrocoelium lanceatum Stiles and Hassall, 1896.

Host: *Bos* (*taurus*?).
Location: Bile ducts?
Locality collected: Manila?

As in the case of *Fasciolopsis* sp., I have not yet encountered this parasite among native cattle. Garrison mentions it as being listed under catalogue No. 143 of the United States Naval Medical School helminthological collection. The parasite was received from the Bureau of Science.

Genus **EURYTREMA** Looss, 1907

Eurytrema ovis sp. nov. Plate 1, fig. 1.

Host: Native sheep.
Location: Fat surrounding the rectum.
Type locality: Los Baños, Laguna Province, Luzon.

The location is unusual for a species belonging to this genus, the habitat of the other members of the genus *Eurytrema* being the pancreas or the pancreatic ducts of their hosts.

This species is closely related to *E. pancreaticum* (Janson) and *E. coelomaticum* (Giard and Billet) but the following characters serve to distinguish it from them: The worm is constricted on both sides at the level of the genital opening, thus producing a distinct shoulder which marks off a rounded anterior extremity; the œsophagus is very short or practically absent; the uterine coils are very closely packed; the uterus passes anteriorly dorsad to the acetabulum, beyond which it forms more loops than have been claimed for either *E. pancreaticum* or *E. coelomaticum;* and the testes are almost in straight transverse line with the acetabulum.

Specific diagnosis.—Body smooth, foliaceous, with wrinkled margins; anterior extremity roundly attenuated and set off from rest of body by a constriction on both sides at level of genital pore; posterior end acutely pointed, as in other members of the genus. In specimens fixed in corrosive sublimate with shaking, the total length is 10.5 to 12 millimeters; maximum width, across or near ovary, 4.6 to 5.4; maximum thickness, in median line through acetabulum, 0.7. In specimens compressed between two glass slides and fixed in corrosive sublimate, the maximum length is 14.6 millimeters; maximum width, 4.9. Suckers prominent and about equal in size; distance between them, measured from their centers, 3.5 to 4 millimeters; oral sucker subterminal, 1.5 to 1.7 millimeters long by 1.3 to 1.6 wide; ventral sucker, 1.3 to 1.5 millimeters long by 1.4 to 1.6 wide. Pharynx small, partly covered by oral sucker, 0.3 to 0.5 millimeter long by 0.3 to 0.4 wide; œsophagus very short or practically absent; intestinal cæca small in diameter, wavy in outline, in ventral view hidden for the most part underneath testes, vitellaria, and uterus, their blind ends terminating to about 1.5 or 1.7 millimeters from posterior tip of body.

Testes symmetrically placed, in straight transverse line with acetabulum; size, about 1 by 0.8 millimeter; lobulated, with from four to six lobes on each testis. Vasa efferentia short, one shorter than the other, due to position of cirrus sac to one side of median line; they meet on the anterior-external side of acetabulum to form the vas deferens, which immediately enters the cirrus pouch that contains the vesicula seminalis, pars prosta-

tica, and protrusible ejaculatory duct. Cirrus pouch elongated and slightly bent, about 1.8 to 2 millimeters long by 0.3 to 0.4 in maximum width; it leads directly to the genital opening which is a little posterior to the bifurcation of the intestinal cæca, in median line.

Ovary slightly smaller than testes, oval in outline, at times distinctly lobulated with three or four lobes; situated posterior to acetabulum, to left or right of median line (sexual amphitypy), but always on the same side as the cirrus sac. Receptaculum seminis oval or rounded, on dorsomesial side of ovary; Laurer's canal long but small in diameter; shell gland diffuse. Uterine coils so closely packed that their distribution into ascending and descending portions is not evident; anteriorly the continuation of the ascending branch passes dorsad to acetabulum, beyond which it forms more loops before joining the narrow vagina, which opens with the ejaculatory duct to the common genital pore. Vitellaria, composed of fairly large follicles, occupy middle third of body, between lateral excretory vessels and uterine coils, from level of middle of testis to about 4 or 5 millimeters from posterior tip of body; vitelline reservoir very small or lacking.

Excretory pore terminal, at posterior end of body; a narrow duct leads from it anteriorly, and this soon becomes enlarged into an excretory bladder which is dorsad to and hidden by the uterine coils. The formation and distribution of the principal excretory vessels similar to those in other members of the genus.

Eggs dark brown, oval, operculated, 0.043 to 0.055 millimeter long by 0.029 to 0.03 in maximum width.

TROGLOTREMIDÆ

Genus PARAGONIMUS Braun, 1899

Paragonimus westermanni (Kerbert, 1878).

Host: Domestic cat.

Location: Lungs.

Locality collected: Manila.

The first and only report of this parasite in a Philippine cat was made in 1907 by Musgrave.(16) In man it has been found several times.

PARAMPHISTOMIDÆ

PARAMPHISTOMINÆ

Genus **PARAMPHISTOMUM** (Fischoeder, 1901)

Paramphistomum cervi (Zeder, 1790).

Hosts: Cattle and carabao.
Location: Rumen.
Localities collected: Manila and Laguna.

Paramphistomum anisocotylea Faust, 1920.(8)

Host: Carabao.
Location: Rumen?
Locality collected: Manila.
I have not seen this parasite.

Genus **COTYLOPHORON** Stiles and Goldberger, 1910

Cotylophoron cotylophorum (Fischoeder, 1901).

Hosts: Cattle and carabao.
Location: Rumen.
Locality collected: Manila.

GASTROTHYLACIDÆ

Genus **CARMYERIUS** Stiles and Goldberger, 1910

Carmyerius gregarius (Looss, 1896).

Hosts: Cattle and carabao.
Location: Rumen and reticulum.
Localities collected: Laguna and Manila.

Genus **FISCHOEDERIUS** Stiles and Goldberger, 1910

Fischoederius elongatus (Poirier, 1883).

Host: Carabao.
Location: Rumen.

GASTRODISCIDÆ

Genus **HOMOLOGASTER** Poirier, 1883

Homologaster poloniae Poirier, 1883.

Host: *Bos* (*taurus*?).
Location: Cæcum.
Locality collected: Manila.

This fluke was reported from the Philippines by Stiles and Goldberger in 1908(24) under the name *Homologaster philip-*

pinensis. According to Maplestone,(15) it is identical to *H. poloniae*.

CESTODA

DIPHYLLOBOTHRIIDÆ

Genus **DIPHYLLOBOTHRIUM** Cobbold, 1858

Diphyllobothrium sp.

Hosts: Dog and cat.
Location: Small intestine.
Locality collected: Manila.

A specific diagnosis cannot be made of this parasite owing to failure to find the head in any of the specimens at hand.

ANOPLOCEPHALIDÆ

ANOPLOCEPHALINÆ

Genus **ANOPLOCEPHALA** E. Blanchard, 1848

Anoplocephala perfoliata (Goeze, 1782).

Host: Horse.
Location: Ileum, cæcum, and colon.

Anoplocephala mamillana (Mehlis, 1831).

Host: Horse.
Location: Small intestine.

These two species of the genus *Anoplocephala* have already been reported by Schwartz.(20) *Anoplocephala perfoliata* is very common in native horses; *A. mamillana*, on the other hand, seems very rare, for I have failed to find it in twenty-one horses that I have examined.

Genus **MONIEZIA** R. Blanchard, 1891

Moniezia expansa (Rudolphi, 1810).

Host: Cattle.
Location: Small intestine.
Locality collected: Mindanao.

Moniezia trigonophora Stiles and Hassall, 1893.

Host: Sheep.
Location: Small intestine?
Locality collected: Manila.

These two species of the genus *Moniezia* have already been reported by Schwartz.(20)

DIPYLIDIIDÆ

DIPYLIDIINÆ

Genus **DIPYLIDIUM** Leuckart, 1863

Dipylidium caninum (Linnæus, 1758).

Hosts: Dog and cat.
Location: Small intestine.

Dipylidium sexcoronatum von Ratz, 1900.

Hosts: Dog and cat.
Location: Small intestine.

This parasite is here reported for the first time from the Philippines and this is also the first record of its occurrence in the cat.

Dipylidium oerleyi von Ratz, 1900.

Hosts: Dog and cat.
Location: Small intestine.
Localities collected: Manila and Los Baños.

This species seems fairly common in Philippine dogs and cats, but this is the first record from the Islands. It is here reported for the first time in the dog.

Dipylidium buencaminoi sp. nov. Plate 1, figs. 2, 3, and 4.

Host: Dog.
Location: Small intestine.
Locality collected: Manila.

This is more closely allied to *Dipylidium oerleyi* than to any other member of the genus. The following characteristics, however, will serve to differentiate it from the latter: The smallness and the shape of its segments; the shape of the head, which is separated from the rest of the body by a comparatively long neck; its short, pyriform cirrus pouch, which does not cross internally beyond the longitudinal excretory vessel; and the large vitellaria which are composed of very minute follicles.

Specific diagnosis.—Entire worm not over 30 millimeters in length. Head (Plate 1, fig. 2) 0.45 millimeter long by 0.23 broad, vase-shaped, and provided with four rounded suckers. Rostellum (Plate 1, fig. 4) conical, about 0.13 millimeter in length by 0.05 in maximum width when fully extended; except at the tip, its anterior half is covered with four or five alter-

nating circlets of rosethorn-shaped hooks; first two or three rows of hooks of about equal size, 0.007 millimeter long; last row of hooks smaller. Head separated from strobila by a long, slender neck, 0.45 to 0.7 millimeter long by 0.09 wide. First proglottides as wide as neck and 0.12 millimeter long; mature segments (Plate 1, fig. 3) 1.6 to 2.3 millimeters in length by 0.5 to 0.75 in maximum width; gravid segments 2.5 to 3 by 0.8 to 0.9. Genital pores not prominent, located at middle of lateral margins of segments or a little posterior of this level. Longitudinal excretory vessels coiled in appearance.

Testes (Plate 1, fig. 3) in mature segments number from 150 to 180 and occupy most of the space between the longitudinal excretory vessels not occupied by the other genitalia. They are crowded so closely together that they press against one another. Vas deferens loosely coiled, extending posteriorly and laterally toward cirrus pouch. Cirrus pouch pyriform, extending transversely from longitudinal excretory canal to genital pore.

Ovaries (Plate 1, fig. 3) bilobed, inner lobe larger than outer, each lobe made up of distinct lobules. Shell gland very small; vitellaria almost as large as ovaries, composed of very minute follicles. In gravid segments, uterine sacs contain from three to twelve eggs, about 0.008 millimeter in diameter.

I take pleasure in naming this parasite for Dr. Victor Buencamino, first Filipino veterinarian, whose success has stimulated other young Filipinos to study veterinary medicine.

Dipylidium halli sp. nov. Plate 1, figs. 5 and 6; Plate 2, fig. 1.

Host: Cat.

Location: Small intestine.

Locality collected: Manila.

This species bears some resemblance to *Dipylidium sexcoronatum* von Ratz, but is distinguished from the latter by the presence of eight alternating circlets of hooks on the rostellum and by the possession of a very elongated cirrus pouch.

Specific diagnosis.—Head (Plate 1, fig. 5) globular, about 0.25 millimeter long by 0.33 wide; suckers prominent. Rostellum (Plate 1, fig. 6) short, 0.083 millimeter by 0.07; except at tip, the entire surface is covered with eight alternating rows of rosethorn-shaped hooks, giving it the appearance of a pineapple fruit. Neck very short or absent. Most anterior segments 0.038 millimeter long by 0.227 wide; mature seg-

ments, 1.3 to 2 by 0.8 to 1; gravid segments, 2.5 to 3 by 1. Longitudinal excretory canals straight in contour. Genital pores moderately prominent, located a little posterior of middle of lateral margins of segments; occasionally they are at junction of middle and posterior thirds of lateral margins of segments.

Testes (Plate 2, fig. 1) in mature segments 100 to 140 in number, sparsely scattered in the parenchyma. Vas deferens coiled, running anteriorly and laterally from immediately in front of corresponding ovary to cirrus pouch. Cirrus pouch much elongated and bent slightly, almost one-third of its length extending inwardly across longitudinal excretory canal.

Ovaries (Plate 2, fig. 1) distinctly bilobed, inner lobe slightly larger than outer, each lobe composed of prominent lobules. Vitellaria distinct, composed of coarse follicles, a short distance posterior of ovaries. Eggs lie in groups of from five to seven within the egg capsules; they are about 0.025 millimeter in diameter.

This species is dedicated to Dr. Maurice C. Hall, of the United States Bureau of Animal Industry, Washington, D. C., in recognition of his work on anthelminthics.

TAENIIDÆ

TAENIINÆ

Genus **TAENIA** Linnæus, 1758

Taenia taeniaformis (Batsch, 1786).

Host: Cat.

Location: Small intestine.

The larval form, *Cysticercus fasciolaris* Rudolphi, of this tapeworm is frequently seen in the liver of field and house rats, white rats, and mice, in Los Baños.

Genus **ECHINOCOCCUS** Rudolphi, 1801

Echinococcus granulosus (Batsch, 1786).

Host: Dog.

Location: Small intestine?

Locality collected: Manila?

This parasite is listed under catalogue No. 150 of the United States Naval Medical School helminthological collection. It was received from the Bureau of Science, according to Garrison.

What is apparently the larval form of this tapeworm has been seen on two occasions in the heart of cattle killed at Los Baños,

which cases have been reported by Schwartz.(20) According to Wharton(26) cases of echinococcus disease in man have been found in the Philippines.

OTHER LARVAL CESTODES

Cysticercus cellulosae (Gmelin, 1790).

Host: Pig.
Location: Muscles.
Localities collected: Manila, Laguna, and Pampanga.

This is the larval stage of *Taenia solium* Linnæus of man. *Cysticercus bovis,* the larval stage of *Taenia saginata,* also of man, has so far not been found in native cattle. Its occurrence is suspected by Schwartz and Tubangui,(22) because of the frequent finding of the adult form in Filipinos.

Cysticercus tenuicollis Rudolphi, 1810.

Host: Pig.
Location: Mesentery.
Locality collected: Pampanga.

The adult form of this bladder worm, *Taenia hydatigena* Pallas of the dog, has never been reported from the Philippines.

NEMATHELMINTHES

NEMATODA

KATHLANIDÆ

Genus **PROBSTMAYRIA** Ransom, 1907

Probstmayria vivipara (Probstmayr, 1865).

Host: Horse.
Location: Large intestine.

The systematic position of this nematode is not well established. Baylis(2) is of the opinion that it is related to members of the family Kathlanidæ.

FILARIIDÆ

FILARIINÆ

Genus **DIROFILARIA** Railliet and Henry, 1911

Dirofilaria immitis (Leidy, 1856).

Host: Dog.
Location: Heart and pulmonary artery.
Localities collected: Manila and Laguna.

Genus **SETARIA** Viborg, 1795

Setaria equina (Abildgaard, 1789).

Host: Horse.
Location: Abdominal cavity and cæcum.

Setaria labiato-papillosa (Alessandrini, 1838).

Host: Cattle.
Location: Abdominal cavity and rumen.

SPIRURIDÆ

SPIRURINÆ

Genus **HABRONEMA** Diesing, 1861

Habronema muscae (Carter, 1861).

Host: Horse.
Location: Stomach.

Habronema microstoma (Schneider, 1866).

Host: Horse.
Location: Stomach.

Habronema megastoma (Rudolphi, 1819).

Host: Horse.
Location: Stomach.

Genus **SPIROCERCA** Railliet and Henry, 1911

Spirocerca sanguinolenta (Rudolphi, 1819).

Host: Dog.
Location: Œsophagus, trachea, and aorta.

ARDUENNINÆ

Genus **ARDUENNA** Railliet and Henry, 1911

Arduenna strongylina (Rudolphi, 1819).

Host: Pig.
Location: Stomach.

Genus **PHYSOCEPHALUS** Diesing, 1861

Physocephalus sexalatus (Molin, 1860).

Host: Pig.
Location: Stomach.

PHYSALOPTERIDÆ

Genus PHYSALOPTERA Rudolphi, 1819

Physaloptera pacitae sp. nov. Plate 2, figs. 2, 3, 4, and 5.

Host: Cat.

Location: Stomach (encysted in the wall).

Locality collected: Los Baños, Laguna, Luzon.

This species differs from *Physaloptera rara* Hall, 1918,(12) of the dog in the appearance of the œsophagus and in the large size of the external teeth of the lips. It is distinguished from *Physaloptera gemina* von Linstow, 1899, of the Egyptian cat in the arrangement of the labial lips and in the number and arrangement of the caudal papillæ of the male.

Specific diagnosis.—Anterior end of body slightly attenuated in both sexes; posterior end conical. Cuticle strongly annulated. Head (Plate 2, fig. 2) marked off by a sort of collar of cuticular structure, which is continued posteriorly in the form of a sheath in which the body is completely inclosed. Mouth with two lateral lips, each presenting three small internal teeth and a large external tooth (Plate 2, fig. 3). Two submedian papillæ near base of each lip. Length of œsophagus about one-fourth that of body; it consists of two distinct portions: a slender anterior part, 0.6 to 0.8 millimeter long, and a thick posterior part, 3.8 to 4 in length. Nerve ring located on slender portion of œsophagus near its junction with the posterior part. Cervical papillæ not very conspicuous, about 1.2 millimeters from anterior end of worm.

Length of male, 19 to 22 millimeters; maximum width, 1.5. Caudal wings (Plate 2, fig. 4) prominent, supported by four pairs of pedunculated papillæ, two of which are preanal and the other two postanal. Behind the anus there are three pairs of sessile papillæ, and immediately in front there is a large unpaired papilla. Spicules dissimilar: right spicule shorter but slightly thicker, about 0.68 millimeter in length by 0.053 in maximum width; left spicule 0.91 in length by 0.038 in maximum width. Circumanal spines prominent, extending anteriorly near anterior end of left spicule.

Female, 23 to 25 millimeters long. Anus about 0.3 to 0.4 millimeter from posterior end of body. Vulva inconspicuous, opposite posterior end of œsophagus on ventral surface. Eggs thick-shelled, 0.048 to 0.05 millimeter long by 0.03 wide.

GNATHOSTOMIDÆ

GNATHOSTOMINÆ

Genus GNATHOSTOMA Owen, 1836

Gnathostoma spinigerum Owen, 1836.

Hosts: Dog and cat.

Location: Stomach.

According to Baylis(1) this species is identical to the *Gnathostoma siamense* of man.

Gnathostoma doloresi sp. nov. Plate 2, fig. 6; Plate 3, figs. 1, 2, 3, 4, and 5.

Host: Pig.

Location: Stomach (head buried in gastric wall).

Locality collected: Los Baños, Laguna Province, Luzon.

This species is very similar in external morphology to *Gnathostoma hispidum* Fedtchenko, but it differs from the latter in the size and appearance of its eggs, which are provided with a polar cap at each end.

Unfortunately, the male of this parasite has not yet been seen. The following description is based on only four mature female specimens:

Specific diagnosis.—Length (female), 30 to 41 millimeters; maximum width, 3.14 to 3.37. In preserved specimens, anterior third of body very much thinner than posterior two-thirds (Plate 2, fig. 6). Head bulb (Plate 3, fig. 2) 0.4 to 0.46 millimeter in length by 0.74 to 0.85 in width, covered with ten rows of singly pointed hooks (Plate 3, figs. 1 and 3). Mouth (Plate 3, fig. 1) with two lateral trilobed lips, each of which bears two submedian papillæ near the base. Œsophagus 6 to 7 millimeters long; nerve ring 0.75 millimeter from anterior end of body; cervical papillæ short, stumpy, opposite nerve ring. Cervical sacs about 2 millimeters long.

Entire surface of body covered with spines (Plate 2, fig. 6); most anterior spines comblike with six or seven subequal points (Plate 3, fig. 3); succeeding spines, to about 9 to 11 millimeters from anterior end of body, 3- to 4-pointed, the middle point longest; rest of body spines simple but long, those near tail much thinner than those placed more anteriorly. Tail rounded, with two terminal papillæ (Plate 3, fig. 4). Vulva behind middle of body. Eggs (Plate 3, fig. 5) with a wart-

like process at each end, 0.06 to 0.063 millimeter long by 0.037 wide; eggshell thick, with very fine granulations on surface.

ASCARIDÆ

ASCARINÆ

Genus **ASCARIS** (Linnæus, 1758)

Ascaris lumbricoides Linnæus, 1758.

Host: Pig.
Location: Small intestine.

Ascaris equorum Goeze, 1782.

Host: Horse.
Location: Small intestine.

Ascaris vitulorum Goeze, 1782.

Hosts: Cattle and carabao.
Location: Small intestine.

Genus **BELASCARIS** Leiper, 1907

Belascaris cati Schrank, 1788.

Host: Cat.
Location: Small intestine.

Belascaris marginata (Rudolphi, 1802).

Host: Dog.
Location: Small intestine.

Genus **TOXASCARIS** Leiper, 1907

Toxascaris canis (Werner, 1782).

Host: Dog.
Location: Small intestine.

OXYURIDÆ

Genus **OXYURIS** (Rudolphi, 1803)

Oxyuris equi (Schrank, 1788).

Host: Horse.
Location: Large intestine.

Schwartz(21) has made observations on the life history of this parasite.

TRICHINELLIDÆ

TRICHURINÆ

Genus **TRICHURIS** Roederer, 1761

Trichuris suis (Schrank, 1788).

Host: Pig.
Location: Large intestine.

Trichuris ovis (Abildgaard, 1795).

Hosts: Cattle, sheep, and goat.
Location: Large intestine.

Trichuris depressiuscula (Rudolphi, 1809).

Host: Dog.
Location: Cæcum.

STRONGYLIDÆ

STRONGYLINÆ

Genus **STRONGYLUS** (Goeze, 1782)

Strongylus equinus (Mueller, 1780).

Host: Horse.
Location: Large intestine.

In the horse this is supposed to be the largest species of the genus *Strongylus;* but, as shown in fig. 1, the species occurring in the Philippine horse is distinctly smaller than *Strongylus edentatus* Looss. The males are 22 to 24 millimeters long; the females, 27 to 30.

Strongylus edentatus (Looss, 1900).

Host: Horse.
Location: Large intestine.

Strongylus vulgaris (Looss, 1900).

Host: Horse.
Location: Large intestine.

Genus **OESOPHAGODONTUS** Railliet and Henry, 1902

Oesophagodontus robustus (Giles, 1892).

Host: Horse.
Location: Large intestine.

Genus **TRIODONTOPHORUS** Looss, 1902

Triodontophorus intermedius Sweet, 1909.

Host: Horse.
Location: Large intestine.

Genus **POTERIOSTOMUM** Quiel, 1909(18)

Poteriostomum imparidentatum Quiel, 1919.

Host: Horse.
Location: Large intestine.

Genus **GYALOCEPHALUS** Looss, 1900

Gyalocephalus capitatus Looss, 1900.

Host: Horse.
Location: Large intestine.

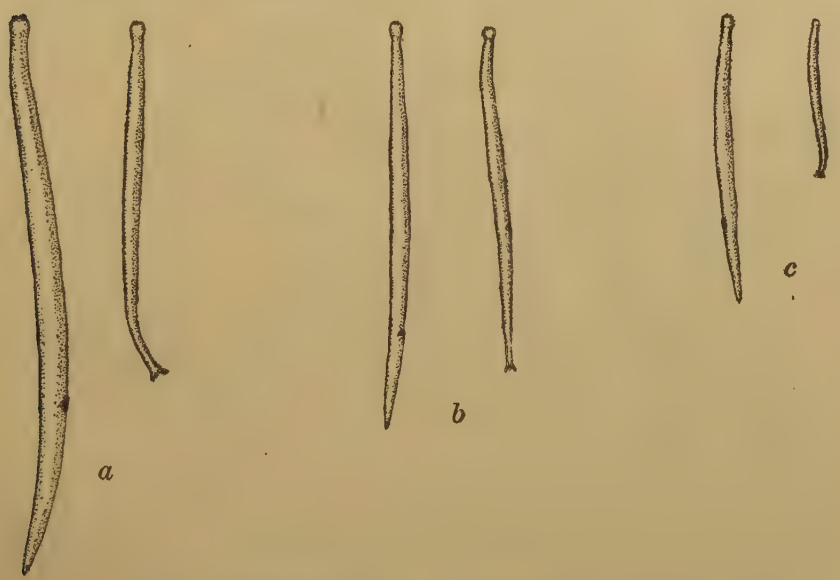

FIG. 1. *a, Strongylus edentatus; b, S. equinus; c, S. vulgaris.*

Genus **CYLICOSTOMUM** Railliet and Henry, 1902

The following species of the genus are all found in the large intestine of the horse:

Cylicostomum labiatum (Looss, 1901).
Cylicostomum catinatum (Looss, 1900).

Cylicostomum pseudocatinatum Yorke and Macfie,[1] 1919.(29)
Cylicostomum goldi Boulenger, 1917.(3)
Cylicostomum elongatum (Looss, 1900).
Cylicostomum insigne Boulenger, 1917.
Cylicostomum auriculatum (Looss, 1900).
Cylicostomum nassatum var. *parvum* Yorke and Macfie, 1918.(28)
Cylicostomum longibursatum Yorke and Macfie, 1918.
Cylicostomum minutum Yorke and Macfie, 1918.

METASTRONGYLINÆ

Genus **METASTRONGYLUS** Molin, 1861

Metastrongylus elongatus (Dujardin, 1845).

Host: Pig.
Location: Bronchi and bronchioles.

I have already called attention to the occurrence of this parasite in a former paper.(25)

TRICHOSTRONGYLINÆ

Genus **HAEMONCHUS** Cobb, 1898

Haemonchus contortus (Rudolphi, 1803).

Hosts: Cattle, sheep, and goat.
Location: Fourth stomach (abomasum).

ANCYLOSTOMINÆ

Group ANCYLOSTOMEÆ

Genus **ANCYLOSTOMA** Dubini, 1843, emend. Looss, 1905

Ancylostoma caninum Ercolani, 1859.

Hosts: Dog and cat.
Location: Small intestine.

Ancylostoma braziliense Gomez de Faria, 1910.

Hosts: Dog and cat.
Location: Small intestine.

This hookworm is of especial interest, as it also infests man. It was first reported from the Philippines by Darling in 1923.(7) It has been frequently found in house cats in Los Baños.

[1] Ihle(14) considers that this species is only a variety of *Cylicostomum catinatum*.

Genus GLOBOCEPHALUS Molin, 1861

Globocephalus longemucronatus Molin, 1861. Fig. 2.

Host: Pig.

Location: Small intestine.

The identity of this parasite is not definitely established. Some writers think that it is a distinct species; others believe that it is identical either with *Crassisoma urosubulatum* Alessandrini, 1909, or with *C. samoense* Lane, 1922. As a result, even the generic name has become involved.

In a recent paper Cameron,(6) though doubting Molin's description and figures, has adopted the generic name *Globocephalus* and has retained *G. longemucronatus* as a separate species—

* * * until a re-examination of Molin's species, should such exist, finally settles the question. Should these not exist, and should subsequent work on pigs not reveal a species with a globular mouth capsule without teeth, the question will require re-investigation.

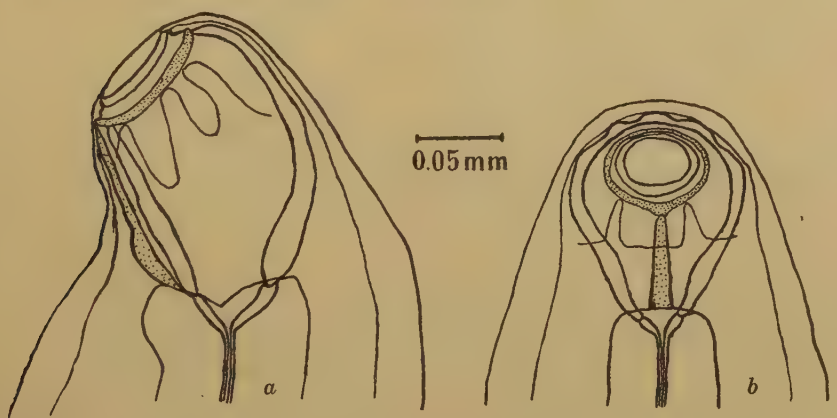

FIG. 2. *Globocephalus longemucronatus*, head; *a*, lateral view (female); *b*, dorsal view (male).

The present report is timely. The specimens at my disposal answer essentially the description given by Cameron for *Globocephalus urosubulatus* except that the mouth capsule is not provided with any vestige of teeth (fig. 2). This finding justifies the existence of the genus *Globocephalus*. One difficulty, however, is encountered: the mouth capsule of Molin's type species is said to be globular, whereas that of the Philippine parasite is cylindrical. Possibly we may have to do here with a dif-

ferent species, but for the present I propose to call the parasite of the Philippine pig *Globocephalus longemucronatus*.

Group OESOPHAGOSTOMEÆ

Genus **OESOPHAGOSTOMUM** Molin, 1861

Oesophagostomum columbianum Curtice, 1890.

Hosts: Cattle, sheep, and goat.
Location: Large intestine.

Oesophagostomum venulosum (Rudolphi, 1809).

Host: Goat.
Location: Large intestine.

Oesophagostomum radiatum (Rudolphi, 1803).

Host: Goat.
Location: Large intestine.

Oesophagostomum dentatum (Rudolphi, 1803).

Host: Pig.
Location: Large intestine.

Group BUNOSTOMEÆ

Genus **BUNOSTOMUM** Railliet, 1902

Bunostomum trigonocephalum (Rudolphi, 1808).

Hosts: Sheep and goat.
Location: Small intestine.

Bunostomum phlebotomum (Railliet, 1900).

Hosts: Sheep and goat.
Location: Small intestine; also abomasum, according to Boynton and Wharton.(5)

Group SYNGAMEÆ

Genus **SYNGAMUS** von Siebold, 1836

Syngamus laryngeus Railliet, 1899.

Host: Cattle.
Location: Larynx.

The occurrence of this parasite in the Philippines was first recorded by Hall in 1915.(11)

SYSTEMATIC POSITION UNCERTAIN

Genus **STEPHANURUS** Diesing, 1839

Stephanurus dentatus Diesing, 1839.

Host: Pig.

Location: Perirenal fat, renal pelvis, and liver.

This parasite is commonly known as the kidney worm of swine and is often responsible for the high rate of mortality among pigs in the Philippines. Its presence here was apparently first recorded by Boynton in 1914.(4) According to Gonzalez and Lago(10) and Newcomb,(17) about 50 per cent of the native pigs are infested with it. It seems, however, to be more pathogenic to the better breeds of imported swine.

LIST OF HOSTS AND THEIR PARASITES

HORSE (EQUUS CABALLUS)

Parasite.	Location.
Anoplocephala mamillana	Small intestine.
Anoplocephala perfoliata	Ileum, cæcum, and colon.
Probstmayria vivipara	Large intestine.
Setaria equina	Abdominal cavity and cæcum.
Habronema muscae	Stomach.
Habronema microstoma	Do.
Habronema megastoma	Do.
Ascaris equorum	Small intestine.
Oxyuris equi	Large intestine.
Strongylus equinus	Do.
Strongylus edentatus	Do.
Strongylus vulgaris	Do.
Oesophagodontus robustus	Do.
Triodontophorus intermedius	Do.
Poteriostomum imparidentatum	Do.
Gyalocephalus capitatus	Do.
Cylicostomum labiatum	Do.
Cylicostomum catinatum	Do.
Cylicostomum pseudocatinatum	Do.
Cylicostomum goldi	Do.
Cylicostomum elongatum	Do.
Cylicostomum insigne	Do.
Cylicostomum auriculatum	Do.
Cylicostomum nassatum var. *parvum*	Do.
Cylicostomum longibursatum	Do.
Cylicostomum minutum	Do.

CATTLE (BOS TAURUS)

Parasite.	Location.
Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Fasciolopsis sp.	Intestine?
Dicrocoelium lanceatum	Bile ducts?
Paramphistomum cervi	Rumen.
Cotylophoron cotylophorum	Do.
Carmyerius gregarius	Rumen and reticulum.
Homologaster poloniae	Cæcum.
Moniezia expansa	Small intestine?
Echinococcus granulosus (larva)	Heart.
Setaria labiato-papillosa	Abdominal cavity and rumen.
Ascaris vitulorum	Small intestine.
Trichuris ovis	Large intestine.
Haemonchus contortus	Abomasum.
Oesophagostomum columbianum	Large intestine.
Syngamus laryngeus	Larynx.

CARABAO (BUBALUS BUBALUS)

Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Paramphistomum cervi	Rumen.
Cotylophoron cotylophorum	Do.
Carmyerius gregarius	Rumen and reticulum.
Fischoederius elongatus	Rumen.
Ascaris vitulorum	Small intestine.
Paramphistomum anisocotylea	Rumen?

SHEEP (OVIS ARIES)

Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Eurytrema ovis	Fat surrounding rectum.
Moniezia trigonophora	Small intestine?
Trichuris ovis	Large intestine.
Haemonchus contortus	Abomasum.
Oesophagostomum columbianum	Large intestine.
Bunostomum trigonocephalum	Small intestine.
Bunostomum phlebotomum	Do.

GOAT (CAPRA HIRCUS)

Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Trichuris ovis	Large intestine.
Haemonchus contortus	Abomasum.
Oesophagostomum columbianum	Large intestine.
Oesophagostomum venulosum	Do.
Oesophagostomum radiatum	Do.
Bunostomum trigonocephalum	Small intestine.
Bunotomum phlebotomum	Small intestine and abomasum.

PIG (SUS SCROFA DOMESTICUS)

Parasite.	Location.
Cysticercus cellulosae	Muscles.
Cysticercus tenuicollis	Mesentery.
Arduenna strongylina	Stomach.
Physocephalus sexalatus	Do.
Gnathostoma doloresi	Do.
Ascaris lumbricoides	Small intestine.
Trichuris suis	Large intestine.
Metastrongylus elongatus	Bronchi and bronchioles.
Globocephalus longemucronatus	Small intestine.
Oesophagostomum dentatum	Large intestine.
Stephanurus dentatus	Perirenal fat, renal pelvis, and liver.

DOG (CANIS FAMILIARIS)

Diphyllobothrium sp.	Small intestine.
Dipylidium caninum	Do.
Dipylidium sexcoronatum	Do.
Dipylidium oerleyi	Do.
Dipylidium buencaminoi	Do.
Echinococcus granulosus	Do.
Dirofilaria immitis	Heart and pulmonary artery.
Spirocerca sanguinolenta	Œsophagus, trachea, and aorta.
Gnathostoma spinigerum	Stomach.
Belascaris marginata	Small intestine.
Toxascaris canis	Do.
Trichuris depressiuscula	Large intestine.
Ancylostoma caninum	Small intestine.
Ancylostoma braziliense	Do.

CAT (FELIS CATUS)

Opisthorchis felineus?	Bile ducts.
Opisthorchis wardi	Do.
Paragonimus westermanni	Lungs.
Diphyllobothrium sp.	Small intestine.
Dipylidium caninum	Do.
Dipylidium sexcoronatum	Do.
Dipylidium oerleyi	Do.
Dipylidium halli	Do.
Taenia taeniaformis	Do.
Physaloptera pacitae	Stomach.
Gnathostoma spinigerum	Do.
Belascaris cati	Small intestine.
Ancylostoma caninum	Do.
Ancylostoma braziliense	Do.

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ILLUSTRATIONS

ABBREVIATIONS

acet, acetabulum.
an, anal opening.
bal, balonet.
bsp, body spines.
cp, cervical papilla.
cs, cervical sac.
cirsp, circumanal spines.
cirs, cirrus sac.
ep, excretory pore.
es, œsophagus.
exbl, excretory bladder.
exv, excretory vessel.
et, external tooth.
gp, genital pore.
hh, head hooks.
int, intestinal branch.
it, internal teeth.
lc, Laurer's canal.
ll, lobes of lips.
nr, nerve ring.
os, oral sucker.
ov, ovary.
pap, submedian papillæ.
ph, pharynx.
rsem, receptaculum seminis.
sespap, sessile papilla.
t, testis.
ut, uterine coils.
vef, vas efferens.
vit, vitellaria.

PLATE 1

FIG. 1. *Eurytrema ovis* sp. nov.
2. *Dipylidium buencaminoi* sp. nov., head and part of neck.
3. *Dipylidium buencaminoi* sp. nov., rostellum.
4. *Dipylidium buencaminoi* sp. nov., mature segment.
5. *Dipylidium halli* sp. nov., head.
6. *Dipylidium halli* sp. nov., rostellum.

PLATE 2

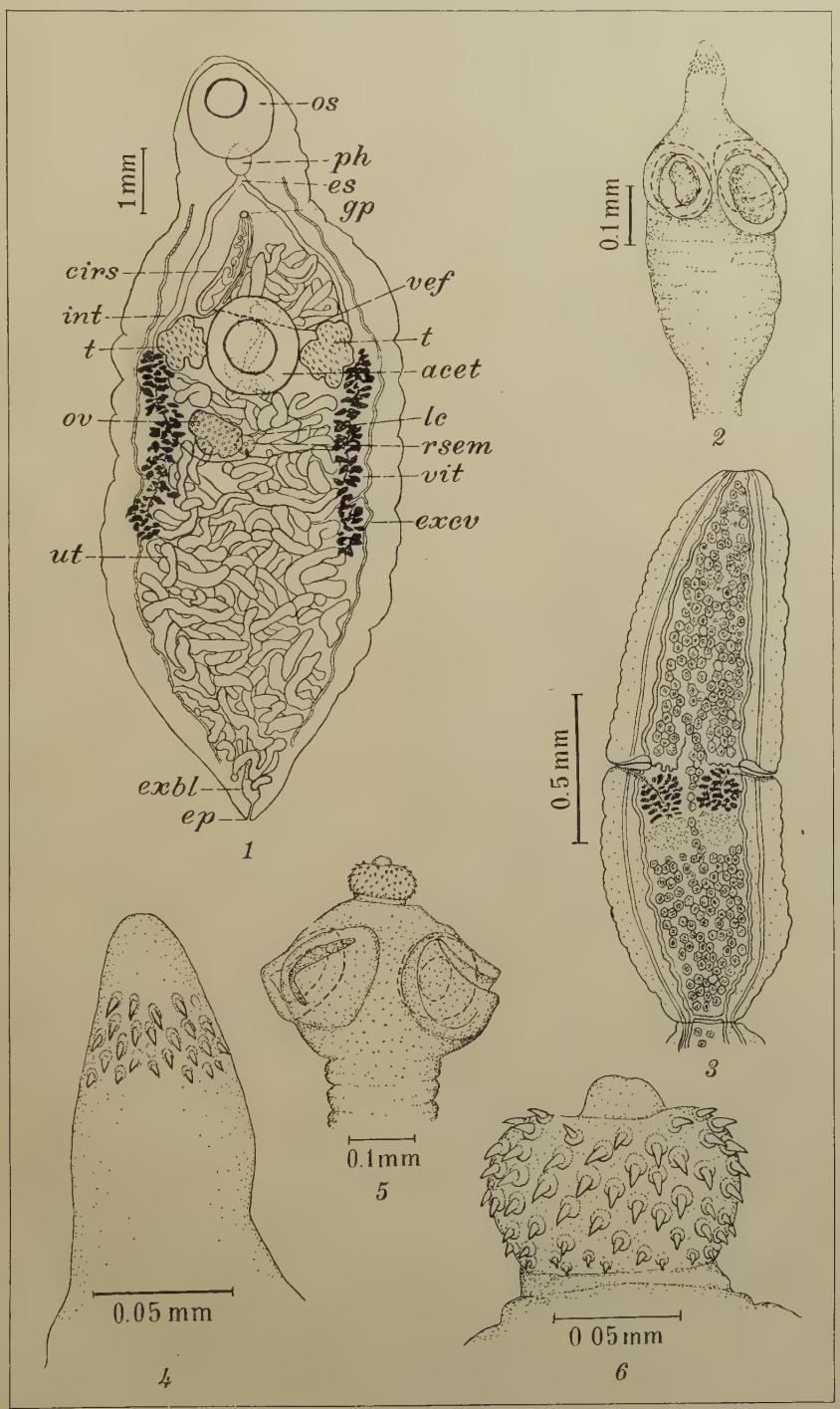
FIG. 1. *Dipylidium halli* sp. nov., mature segment.
2. *Physaloptera pacitae* sp. nov., anterior end of body, ventral view.
3. *Physaloptera pacitae* sp. nov., head, anterior view.
4. *Physaloptera pacitae* sp. nov., posterior end of male, ventral view.
5. *Physaloptera pacitae* sp. nov., eggs.
6. *Gnathostoma doloresi* sp. nov., female, × 3.

PLATE 3

FIG. 1. *Gnathostoma doloresi* sp. nov., anterior end, ventrofrontal view.
2. *Gnathostoma doloresi* sp. nov., anterior end, ventral view.
3. *Gnathostoma doloresi* sp. nov.; *a*, head hooks; *b*, *c*, *d*, body spines.
4. *Gnathostoma doloresi* sp. nov., posterior end of female, ventral view.
5. *Gnathostoma doloresi* sp. nov., eggs.

TEXT FIGURES

FIG. 1. *a*, *Strongylus edentatus* (Looss); *b*, *S. equinus* (Mueller); *c*, *S. vulgaris* (Looss).
2. *Globocephalus longemucronatus* Molin, head; *a*, lateral view (female); *b*, dorsal view (male).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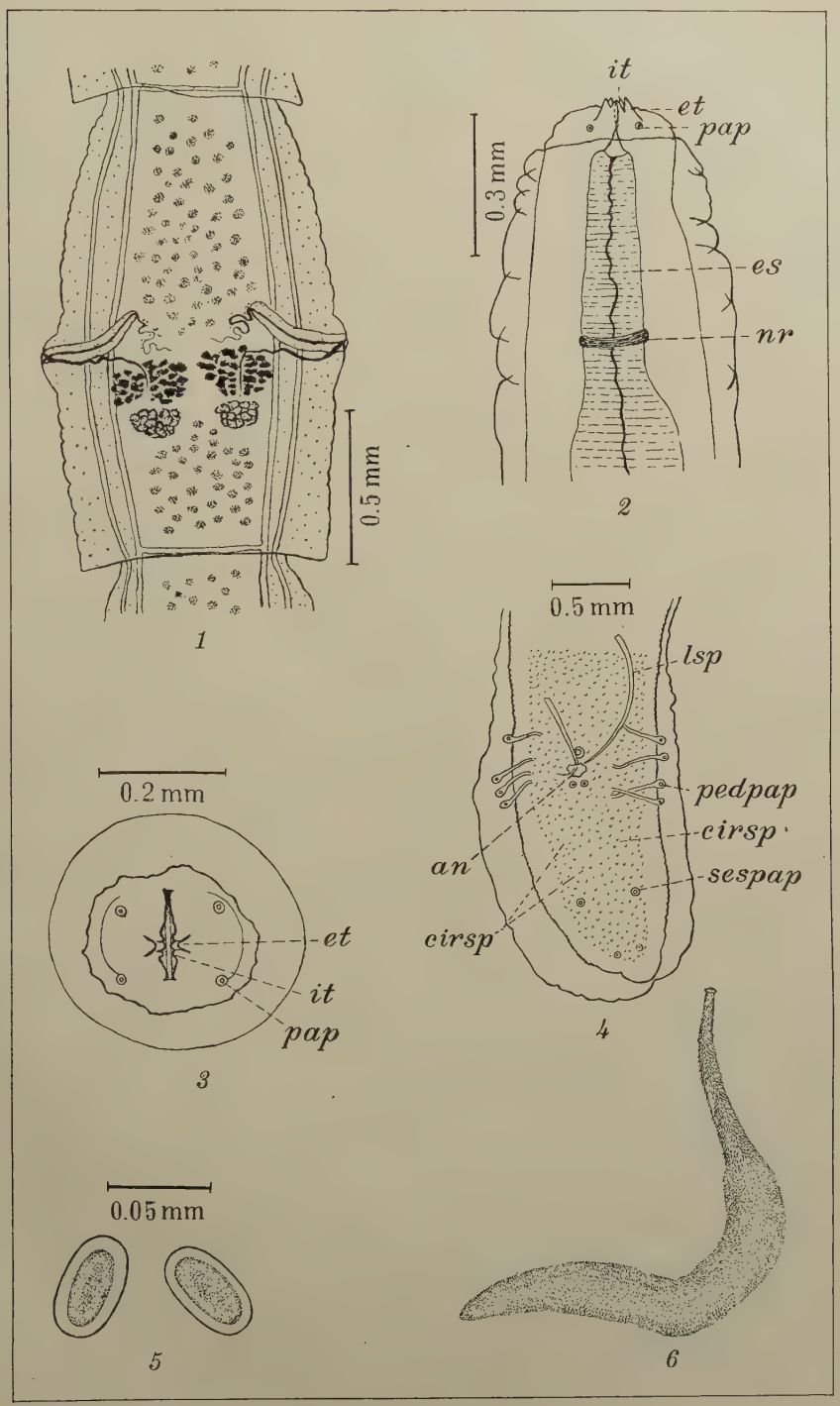
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PLATE 2.

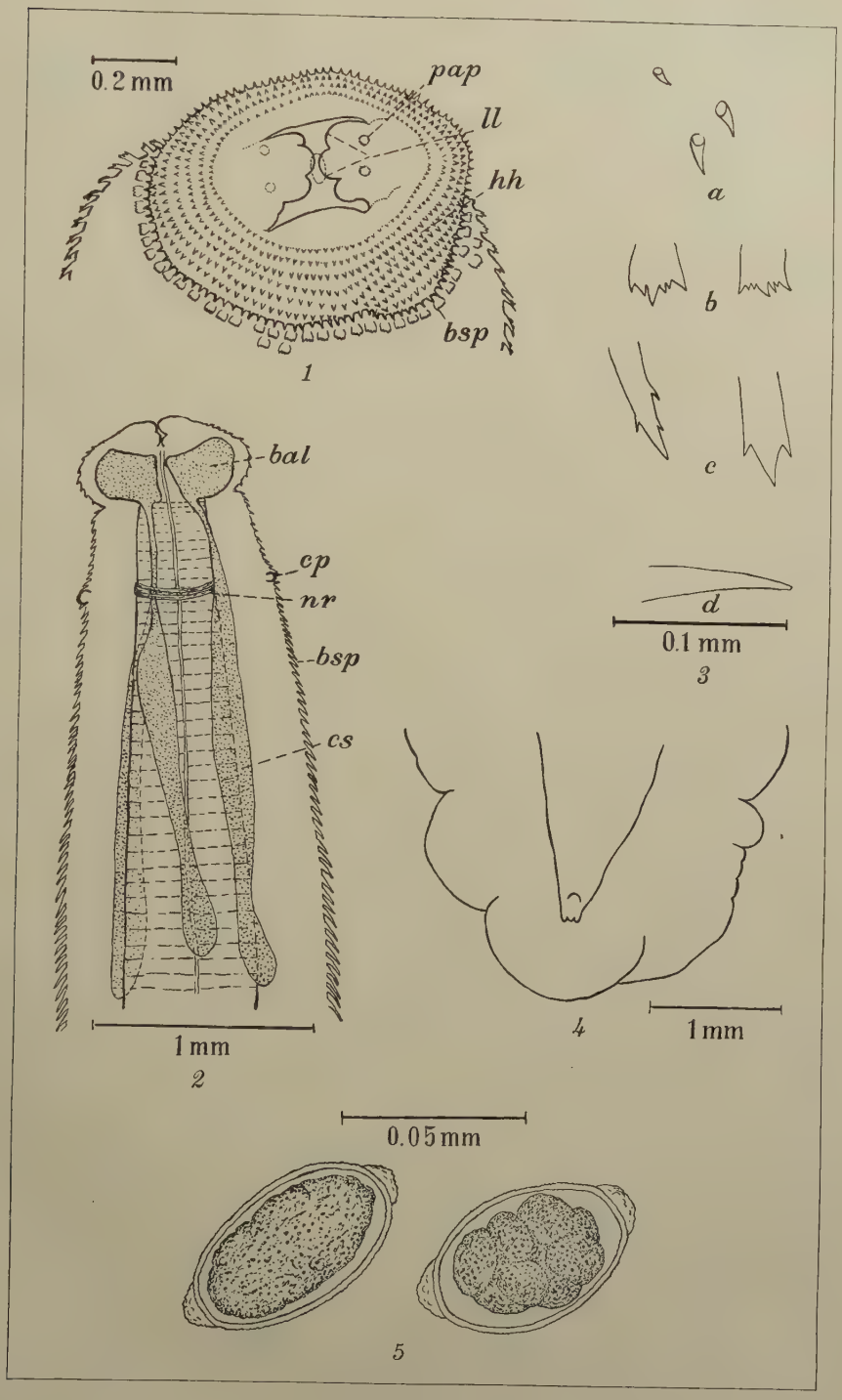
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PLATE 3.

NOTES ON PSYLLIDÆ

By D. L. Crawford

Of the University of Hawaii, Honolulu

ONE TEXT FIGURE

In the examination of specimens of Psyllidæ from the Philippine Islands and other Pacific regions, several new species have appeared, and these are used as the basis for the following notes:

Genus STENOPSYLLA Kuwayama

This is a specialized genus of Triozinæ, and is characterized conspicuously by the very thick and densely pubescent antennæ. Two very closely similar species have been known in this genus, *S. nigricornis* Kuwayama [1] and *S. longicornis* Crawford,[2] and now a third species appears, similar in most respects but very strikingly different in wing venation. In spite of this difference, however, it appears to be congeneric with the two species mentioned above.

Key to the species of Stenopsylla Kuwayama.

a^1. Venation of forewing triozine (that is, basal vein branching at one point into three veins, cubitus, media, and radius).

b^1. Body yellowish or light brown, dorsum flecked with brown; genal cones acutely pointed; antennæ half as long as forewings; insect about 5 to 6 millimeters long. (Formosa.)
S. nigricornis Kuwayama.

b^2. Body light brown, mesothoracic dorsum and vertex black or dark brown; genal cones broadly rounded at apex; antennæ three-fourths as long as forewings; insect 6 to 7 millimeters long. (Philippines.)
S. longicornis Crawford.

a^2. Venation of forewing not as above; cubitus branching off first, then media and radial sector more distad (see fig. 1). **S. bakeri sp. nov.**

Stenopsylla bakeri sp. nov. Fig. 1.

A large species, body from head to tip of folded wings being about 8 millimeters long; forewings, 6 to 6.5. General color

[1] Trans. Sapporo Nat. Hist. Soc. 3 (1910) 53.
[2] Philip. Journ. Sci. 15 (1919) 203.

light yellowish brown; dorsulum and eyes black, vertex brown and antennæ brown to black, except apical one-fifth white.

Head broad, vertex very concave, posterior ocelli elevated; genal cones about half as long as vertex, very broad and bluntly rounded. Antennæ long, nearly as long as forewings (about 5 millimeters), thick (nearly as thick as legs), very densely pubescent.

Thorax long, not very broad, pronotum short and much depressed below level of head and dorsulum. Legs stout, hind tibiæ armed with black spines apically. Forewings very large, hyaline and transparent except a narrow black stripe along axial vein, acutely pointed; venation as shown in fig. 1; hind wings about half as long as front wings.

FIG. 1. *Stenopsylla bakeri* sp. nov., venation of forewing.

Abdomen (female) long, moderately slender, with genital segment relatively very short and blunt.

Locality, Philippines, Mindanao, Iligan (*C. F. Baker*), 1 female.

Euphalerus nigrivittatus Crawford **pubescens** var. nov.

A single specimen of this species, taken by C. F. Baker on Basilan Island, Philippines, shows a number of superficial variations worthy of note. The black vittæ from eyes to base of wings are wanting, the thorax and vertex being more or less uniformly straw color or whitish; the antennæ are uniformly straw color, not black at tip of each segment as is usually the case in the species. The clear spots in the apical brown band of the forewing are larger and more conspicuous, being circular instead of crescentic.

The genal cones are not squarish as in the species, but bluntly rounded and divergent. On the dorsum of thorax as well as on the vertex there is a conspicuous though not dense pubescence.

Genus STROPHINGIA Enderlein

(Including *Haplaphalara* Uichanco)

This genus is very close to *Aphalaroida* and might conceivably be merged with it. In the matter of priority, *Aphalaroida* was described one month before the other [3] and so would have the right of priority. However, there appear to be several distinctive characteristics separating the two genera, making it advisable to consider both as valid groups of the subfamily Aphalarini.

The genus *Strophingia* was erected for an old species, *Rhinocola ericae* Curtis, and doubtless will have a considerable number of old and new species added to it in due time. The type species of *Rhinocola* is *R. aceris* Linnæus, which is very different [4] in several respects from most of the other species subsequently referred to that genus. Some of these probably will go to *Eurhinocola* Crawford,[5] but some, also, should be referred to Enderlein's *Strophingia.*

Strophingia differs from *Aphalaroida* chiefly in the texture of the forewings. *Strophingia* has semitransparent wings, whereas the forewings of *Aphalaroida* are thick and opaque. *Aphalaroida,* furthermore, has a conspicuous and distinctive clothing of thick, glandular hairs on the body surface and sometimes on the wing surface as well, whereas the other genus lacks this characteristic entirely.

Haplaphalara Uichanco [6] was erected in 1921 for a previously known species of *Aphalara* (*Aphalara dahli* Rübsaamen), which is not congeneric with other species of that genus. However, between this species and those referred to *Strophingia* there are no real generic differences, and therefore I propose that *Haplaphalara* be considered a synonym of *Strophingia.*

Description.—Usually very small insects, body about 1 to 2 millimeters long; head small; vertex flat, about half as long as wide, with front ocellus on its anterior margin. Frons a small sclerite beneath vertex, visible from in front or in ventral aspect, bearing the front ocellus at its anterior end; genæ slightly swollen beneath vertex, but not produced in conical processes or lobes.

[3] *Aphalaroida,* U. S. Nat. Mus. Bull. 85 (June 3, 1914) 38.

[4] *Strophingia,* Ent. Mitt. 3 (July 1, 1914); see U. S. Nat. Mus. Bull. 85 (1914) 24.

[5] Rec. Ind. Mus. 7 (1912) 422.

[6] Philip. Journ. Sci. 18 (1921) 260.

Antennæ short, usually about as long as width of vertex (between eyes), but sometimes as long as width of head including eyes, or longer. Eyes hemispherical.

Forewings usually semihyaline or hyaline (not thick and opaque), broadly rounded; pterostigma usually present, either closed or open; membrane often maculated or colored.

Type of genus, *S. ericae* (*Rhinocola ericae* Curtis).

In addition to the type species, the following three species should be referred to this genus:

Rhinocola targioni Licht., Verh. Zool. Bot. Ges. Wien 38: 12.

Paurocephala orientalis Crawford, Philip. Journ. Sci. 10 (1915) 261. Locality, Philippine Islands.

Aphalara (*Haplaphalara*) *dahli* Rübsaamen, Marcellia 4 (1905) 22; Philip. Journ. Sci. 18 (1921) 260. Localities, Bismarck Archipelago and Philippine Islands.

Spanioneura arcuata Crawford.

Katacephala arcuata CRAWFORD, Bull. U. S. Nat. Mus. 85 (1914) 115.

This species appears to be more closely allied to the old genus *Spanioneura* than to *Katacephala*, since the latter has broad, rhomboidal wings.

Locality, Mexico.

Spanioneura conigera Crawford.

Paurocephala conigera CRAWFORD, Philip. Journ. Sci. 15 (1919) 151.

This species was referred to *Paurocephala* with some doubt as to its proper relations. It appears to be closely related to species of *Spanioneura*.

Locality, Moluccas, Amboina.

Spanioneura quadrimaculata sp. nov.

Very similar to *S. conigera* Crawford, differing most strikingly in the presence of four conspicuous, square, black spots on vertex, two on each side of front ocellus.

Head flexed sharply downward into a vertical position; vertex large, about twice as broad as long, slightly convex. Genal cones large, broad, nearly contiguous on inner margin, subacutely pointed. Antennæ twice as long as width of head, very slender.

Forewings semitransparent (slightly thickened or coriaceous), with a tinge of brown at apex; venation similar to that of *S. conigera*.

Locality, Philippines, Mindanao, Dapitan (*Baker*), 1 specimen.

ILLUSTRATION

TEXT FIG. 1. *Stenopsylla bakeri* sp. nov., venation of forewing.

A NEW SPECIES OF SAMBUS FROM MANILA (COLEOPTERA; BUPRESTIDÆ)

By W. S. Fisher

Of the Bureau of Entomology, United States Department of Agriculture

Sambus atropurpureus sp. nov.

Rather robust and moderately convex; above black, with a slight purplish tinge, the head slightly rubineous in front, and the elytra marked with transverse zigzag bands of silvery white pubescence; beneath black, with a feeble æneous reflection, and rather densely clothed with short white pubescence.

Head broadly grooved, the groove becoming deeper on vertex and occiput and causing two more or less distinct gibbosities on vertex, and two similar ones on the front, the surface densely, finely granulose, obsoletely reticulate, and sparsely clothed with rather short recumbent silvery white hairs, with a few dark inconspicuous hairs on the elevated areas; antennæ black, with a feeble æneous or purplish tinge on the basal joints, not quite extending to middle of pronotum, and serrate from the fifth joint; clypeal suture distinct and strongly elevated; epistoma rather wide, transverse between the antennæ, and deeply depressed.

Pronotum twice as wide as long, slightly narrower in front than behind, and widest at middle; sides flattened and regularly arcuate, with the lateral margins finely crenulate and the posterior angles broadly rounded; anterior margin feebly bisinuate, without a distinct median lobe; base deeply arcuately emarginate at the elytral lobes, with a broadly rounded median lobe, which is subtruncate in front of scutellum; lateral carina strongly arcuate, and extending from base to apical third, but not touching lateral margin; disk strongly convex anteriorly and limited at basal fourth by a broadly rounded transverse depression; surface rather densely punctate and coarsely reticulate, the reticulation more or less concentrical on the disk, and sparsely clothed with short silvery white and inconspicuous black hairs intermixed. Scutellum large, purplish black, triangular, strongly acuminate posteriorly, and the surface densely finely reticulate.

Elytra at base about equal in width to the pronotum at middle, rather convex, with shallow basal depressions, and a similar one along the lateral margins behind the humeri; sides parallel along basal fourth, feebly arcuately constricted in front of the middle, arcuately expanded at apical third, then arcuately attenuate to the tips, which are broadly conjointly rounded, finely serrate, and not entirely concealing the abdomen; surface rather coarsely, densely imbricate, rather densely clothed with short inconspicuous dark hairs of the same color as the surface, and ornamented with broader silvery white hairs as follows: A rather inconspicuous series of transverse zigzag bands on basal half, and a very distinct double row of similar bands at apical third.

Abdomen finely and densely reticulate, the last segment deeply arcuately grooved along the apical margin, and the area in front of the groove broadly, but not deeply arcuately emarginate.

Length, 4.75 millimeters; width, 2.

Type, catalogue No. 27299, United States National Museum.

Described from a single example collected by R. C. McGregor, at Manila, Luzon, during April, 1924.

This species is closely allied to *Sambus lugubris* Saunders and *Sambus aeneicollis* Fisher, but differs from both in being of a purplish black color above. From the former it also differs in having the head more gibbose on the front, sides of pronotum not as broadly flattened, and the elytral markings composed entirely of silvery white pubescence. From *aeneicollis* it can be distinguished also by its being more robust. It also resembles *Sambus nigricans* Fisher, but in that species the head is not gibbose or as deeply grooved, the pronotum is more regularly convex, and the elytra have a single transverse zigzag pubescent band at apical third, behind which is a broad transverse band of the same color.

THE ANTS OF THE PHILIPPINE ISLANDS

PART I, DORYLINÆ AND PONERINÆ

By WILLIAM MORTON WHEELER

Dean, Bussey Institution, Boston

and

JAS. W. CHAPMAN [1]

Professor of Zoölogy, Silliman Institute, Dumaguete, Oriental Negros

TWO PLATES

FORMICIDÆ

Subfamily DORYLINÆ Leach

Tribe ECTONINI FOREL

Genus AENICTUS Shuckard

Aenictus laeviceps F. Smith.

Typhlatta leviceps F. SMITH, Journ. Linn. Soc. London Zool. 2 (1857) 79.

Type locality: BORNEO, Sarawak (*A. R. Wallace*).

LUZON, Laguna Province, Los Baños (*F. X. Williams*), 18 workers.

Aenictus aratus Forel.

Aenictus aratus FOREL, Ann. Soc. Ent. Belg. 44 (1900) 74.

Type locality: Australia; Queensland, Makay.

LUZON (*Williams*), 1 specimen.

This specimen from Luzon agrees perfectly with Forel's description and with a specimen of *A. aratus* in the senior author's collection bearing Forel's label.

Aenictus martini Forel.

Aenictus martini FOREL, Journ. Bombay Nat. Hist. Soc. 13 (1901) 464 and 473.

Type locality: Malacca; Pahang (*R. Martin*).

LUZON, Laguna Province, Los Baños (*Williams*), 8 workers; Mount Maquiling (*3083 C. F. Baker*), 1 worker. NEGROS,

[1] Collaborator, United States Bureau of Entomology.

Oriental Negros Province, Dumaguete, Horns of Negros (*J. W. Chapman*).

Twenty workers were taken from a foray, Horns of Negros, December 25, 1918, at 450 meters altitude. They were passing over bushes with no definite regularity and were moving quite rapidly. They could not be found a few hours later. Repeated search for them has been made but they have not been seen since, which seems to indicate that they migrate long distances. Specimens from Dumaguete seem to be a little lighter in color than those taken by Williams in Luzon.

Aenictus luzoni sp. nov. Plate 1, figs. 1 and 2.

Worker.—Length, 4.5 millimeters. Head rectangular, one and one-half times as long as broad; sides moderately rounded; occipital corners and occipital border rounded. Antennal hollows deep and moderately far apart. Scape of antennæ barely extending to corners of head; joints of flagellum longer than broad. Anterior margin of clypeus rounded. Mandibles triangular, broadest at their apical borders; apical tooth acute and curved; subapical tooth at apical third of mandible.

Thorax with pronotum rounded anteriorly and convex above; narrower than the head. Mesonotum somewhat compressed. Epinotum rounded above; apical part sloping. Nodes of petiole and postpetiole as broad as long, rounded above, a little distance apart. Abdomen large and oval; basal segment petiolate anteriorly.

Smooth and shining. Mandibles finely striated. Mesopleura with a few nearly obsolete longitudinal striæ, some of which extend on to the base of epinotum.

Body covered with sparse, recumbent yellow hairs, more abundant on antennæ and apical joints of legs.

Reddish brown; darker on vertex. Lateral spots on head yellow, and not placed as high on the sides as in *A. martini.*

LUZON, Ilocos Norte Province, Bangui (*C. S. Banks*), 8 workers.

Aenictus camposi sp. nov. Plate 1, figs. 3 and 4.

Worker.—Length, 2.5 millimeters. Head rectangular, almost one and one-half times as long as broad; sides slightly curved; occipital corners and borders rounded. Antennal scape scarcely reaching beyond corners of head. Joints of flagellum longer than broad; first and second twice as long as broad, subequal.

Antennal furrows shallow and approximate. Anterior margin of clypeus convex. Mandibles with finely denticulate borders; apical tooth acute and curved.

Pronotum narrower than head, convex above; mesonotum compressed. Basal portion of epinotum long; apical part short, declivity vertical, margined on its lateral borders. First petiolar node fully twice as long as broad; postpetiolar node slightly shorter and well separated from first. Gaster small and oval; legs long and slender, very little incrassate.

Smooth and shining. Mesonotum and base of epinotum finely rugose, subopaque. Abdomen shining and almost translucent.

Covered with sparse recumbent yellow hairs, more abundant on antennæ and legs.

Yellowish; nodes of petiole and postpetiole, apex of gaster, and undersides of antennæ lighter yellow. Head without lateral spots.

Resembles *A. wroughtoni* Forel, but is easily distinguished by the rugose epinotum, the color, and the slighter femora. A remnant of a male shows filiform antennæ, with the second joint of the flagellum longer than the scape. The male *A. wroughtoni* has the scape spatulate.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 1,200 meters altitude (*Chapman*).

A nest of this ant was found beneath the bark of a fallen dead tree by the junior author and one of his students during May, 1918. No sex forms were taken at that time. Unfortunately the vial which contained them was broken during the day and only a few individuals were saved. This log was examined in 1919 and again in 1921, but no trace of them was found. During May, 1922, a large colony consisting of 80 workers, 50 larvæ, 200 pupae, and the broken remains of one male were found.

This species is dedicated to Juan D. Campos, who was with the junior author during 1918 when the species was first found.

Aenictus sp.

Males of seven species of *Aenictus* have been taken at lights by various collectors in the Islands.

LUZON, Laguna Province, Mount Maquiling (*Williams*), two species; (*Baker*), one species; (from Staudinger and Bang-Haas), one species: Mountain Province, Baguio (*Williams and Chapman*), one species: Bataan Province, Limay (from Staudin-

ger and Bang-Haas). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters (*Chapman*).

Males have been frequently taken at light at 450 meters altitude, which shows that there are several other species of *Aenictus* in the Islands, the workers of which have not been seen.

Description of these males will be reserved till further collections are made.

Subfamily CERAPACHYINÆ Forel

Tribe CERAPACHYINI Forel

Genus **CERAPACHYS** F. Smith

Cerapachys rufithorax sp. nov. Plate 1, figs. 5, 6, and 7.

Worker.—Length, 3.75 millimeters. Head rectangular, one-fifth longer than broad, with moderately rounded sides, nearly rectangular occipital corners, and straight occipital border. Eyes large, slightly curved; situated a distance equal to their longest diameter from anterior lateral angles of head. Antennal scape club-shaped, extending barely to posterior border of eyes. First flagellar joint as long as broad; 2 to 11 transverse. Apical joint as long as the preceding eight and two and one-half times as long as broad. Frontal carinæ short and separated by about the width of the basal part of scape. Carinæ of cheeks smooth. Anterior border of clypeus convex. Mandibles triangular and apical border finely dentate.

Thorax twice as long as broad, sides straight, anterior border rounded, feebly margined, in profile convex above. Epinotal declivity sloping, concave, with the smallest trace of margination on its lateral borders, but none above. Petiolar node subquadrate, truncated anteriorly, marginate about the truncated portion, rounded transversely above; ventral tooth triangular and situated well forward. Postpetiole similar to petiole, but a third broader and higher. Remainder of gaster twice as long as broad.

Shining; mandibles and scape finely punctate and shining. Head and gaster covered with scattered foveolate punctures, nearly obsolete on thorax, which is smoother. Epinotal declivity smooth and shining. Petiolar node and postpetiole finely rugose, subopaque; shining in certain lights. Anterior surface of legs minutely punctured, posterior surface smooth.

Covered with long, dense, recumbent grayish hairs; very dense on petiole and postpetiole, partially hiding the sculpture.

Pleuræ of epinotum, anterior face of petiole, postpetiole, antennal clubs, and apical joints of legs covered with dense stiff hairs.

Red. Head and gaster reddish brown. Thorax, petiole, and postpetiole lighter. Club of antennæ and tarsi reddish yellow.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

A nest of more than 40 workers, including larvæ, eggs, and a few pupæ, was found beneath the sheath of a leaf of *Palma brava*.

Cerapachys negrosensis sp. nov. Plate 1, fig. 8.

Worker.—Length, 3 millimeters. Head rectangular, one-fifth longer than broad, sides feebly rounded, occipital corners rounded with occipital border straight. Eyes moderate in size and placed a distance equal to their longest diameter from base of mandibles. Antennal scapes at their apical end more than twice as thick as first funicular joint. Club as long as preceding five joints and as broad as apical portion of scape. Antennal carinæ short, approximate. Anterior margin of clypeus nearly straight.

Thorax very little convex, rounded transversely, without margination. Base of epinotum rounded into apical portion, not margined at lateral angles or above. Node of petiole cuboidal, as high as base of epinotum, truncated anteriorly, with trace of margination, postpetiole as broad as long, gaster ovate.

Mandibles shining; head, thorax, and apical part of gaster sparsely covered with foveolate punctures, less noticeable on thorax, which is rugose and subopaque, like the node of petiole and postpetiole. Mandibles and scape covered with sparse piligerous punctures.

Entirely covered with recumbent white hairs, more noticeably on petiole and postpetiole; dense, short, stiff hairs on antennæ and legs.

Red. Head and apical segments of gaster reddish brown. Thorax, petiole, postpetiole, and appendages paler. Club of antennæ and tarsi still paler.

Resembles the preceding species, but is very much smaller in every respect. The thorax is less convex in profile and more rugose. The declivity of the epinotum is not margined either laterally or above.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 700 meters altitude (*Chapman*), 1 worker.

Cerapachys nitida sp. nov. Plate 1, figs. 9 and 10.

Worker.—Length, 3.5 millimeters. Head rectangular, one and one-fourth times as long as broad, posterior angles feebly rounded, occipital border straight. Eyes medium, convex, their longest diameter equal to the breadth of apical portion of scapes; about in the middle line of head. Antennal scapes stout, barely reaching to posterior orbits of eyes. Antennal club as long as the preceding seven joints. Frontal carinæ separated from each other by the width of the base of scape. Anterior margin of clypeus almost straight. Mandibles slight, apical border bearing minute teeth.

Thorax rectangular, sides straight, one and one-half times as long as broad, anterior angles rounded. In profile straight and somewhat flat. Epinotal declivity oblique, concave, not margined laterally or above. Node of petiole a little longer than broad, including the ventral spine as high as long. Postpetiole subquadrate, basal segment of gaster longer than broad.

Shining; head, mandibles, scape, thorax, postpetiole, and gaster covered with fine piligerous punctures, more obsolete on pleura of thorax and partly covered by the pilosity of gaster. Node of petiole delicately rugose and subopaque.

Body covered with recumbent gray hairs; short, stiff, and more abundant on antennal club, tarsi, lateral pleuræ of epinotum, and node.

Red. Node of petiole reddish yellow. Club of antennæ and tarsi yellow.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), 6 workers nesting under the bark of a fallen dead tree.

Cerapachys muiri sp. nov. Plate 1, figs. 11 and 12.

Worker.—Length, 4.5 millimeters. Head one and one-fourth times as long as broad, slightly broader behind than in front. Eyes moderately convex, their distance from anterior lateral angles of head equal to their longest diameter. Antennal scapes stout, clublike, extending to posterior orbits of eyes. Segments 2 to 11 of flagellum transverse, club two and one-half times as long as broad. Mandibles stout, apical border broad, toothed. Anterior margin of clypeus slightly convex, carinæ of cheeks crenulate.

Thorax twice as long as broad, in profile convex. Base of epinotum rounding into apical portion. Space of declivity marginate at lateral borders but not above. Node of petiole as long

as broad, truncated in front, marginate, rounded anteriorly and posteriorly. Postpetiole as broad as long, basal segment of gaster twice as long as postpetiole.

Shining; head and abdomen covered with piligerous punctures which are coarser on petiole, postpetiole, and posterior angles of epinotum. Epinotal declivity smooth.

Completely covered with sparse, recumbent gray hairs, more abundant on petiole, postpetiole, gaster, antennæ, and legs. Antennal club covered with a short gray pile.

Deep red. Antennal club reddish yellow.

LUZON, Laguna Province, Los Baños (*F. Muir*), 1 worker.

Genus **LIOPONERA** Mayr

Lioponera luzuriagæ sp. nov. Plate 1, figs. 13 and 14.

Worker.—Length, 3.5 millimeters. Head rectangular, about one and one-fourth times as long as broad, sides feebly curved, occipital border straight. Antennal scapes club-shaped, barely reaching middle transverse line of head. Antennal carinæ short, space between them equal to the width of scape at its base. Flagellar joints 2 to 6 transverse. Eyes large, their diameter little less than one-third length of head, placed well forward on sides of head, less than half their diameter from its anterior angles. Anterior margin of clypeus feebly curved. Mandibles triangular, apical borders minutely dentate.

Thorax rectangular, more than twice as long as broad, front rounded, epinotal declivity oblique. Node of petiole nearly as long as broad, very little convex above and truncated in front, transverse behind. Postpetiole as long as basal segment of gaster and one-third longer than broad.

Subopaque; shining in certain lights. Thorax and abdomen covered with fine, delicate, foveolate, piligerous punctures, more abundant on front of head. Space between eyes at anterior third smooth. Mandibles and scape feebly punctured.

Dense recumbent white pile, hiding the sculpture in large part, covers the body, more abundant on legs, antennæ, sides of head, and abdomen.

Reddish brown; head, anterior border of pronotum, antennæ, and legs lighter.

Female.—Length, 3.5 millimeters; dealated. Similar to the worker. Head almost one-third longer than broad. Thorax one and one-half times as long as broad, sides very little rounded. Epinotal declivity oblique; gaster long and slender.

NEGROS, Oriental Negros Province, Luzuriaga, Horns of Negros, 450 meters altitude (*Chapman*), 16 workers and 1 female.

Lioponera bicolor sp. nov. Plate 1, figs. 15 and 16.

Worker.—Length, 2.7 millimeters. Head rectangular, a little longer than broad, sides feebly curved, occipital border straight. Eyes large, slightly convex, placed just back of the base of mandibles. Antennal scapes extend to middle line of head. Mandibles triangular, apical borders broad, finely dentate. Anterior margin of clypeus transverse.

Thorax rectangular, twice as long as broad, in profile very little curved. Epinotal declivity oblique, concave. Node of petiole broader than long, emarginate anteriorly and concave. Basal segment of abdomen twice the length and height of node.

Smooth and shining. Head smooth, with minute scattered punctures. Thorax and node shining. Basal segment of gaster subopaque, remainder of gaster smooth.

Covered with fine recumbent yellow hairs, more abundant on legs and gaster.

Yellow; head and apical segments of abdomen black. Mandibles, antennæ, thorax, node, and apical segment of abdomen yellowish.

Resembles *L. parva* Forel, but the head and the abdomen are black.

Female.—Length, 3.5 millimeters. With the exception of the sexual characters and size, the female resembles the worker in all respects.

Male.—Length, 3.5 millimeters. Head including eyes broader than long, convex and somewhat constricted behind; without posterior corners; cheeks very short; eyes large, two-thirds as long as head, very convex; ocelli large; mandibles long, narrow, with relatively broad mascatory margin, with apical tooth acute. Clypeus large, anterior border rounded. Antennal carinæ short, moderately far apart; scape long but not reaching posterior border of eyes; funicular joints 8 to 11 distinctly longer than broad.

Thorax robust, broadest anterior to wings, convex above; scutellum convex, broader than long. Base of epinotum somewhat truncated, equal in length to apical portion.

Petiole as broad as long, rounded above, with anterior-ventral spine prominent. Gaster long.

Smooth and shining. Pilosity similar to that of the worker. Color uniformly brownish throughout.

LUZON, Laguna Province, Los Baños (*Williams*), several workers, males, and females.

Lioponera bakeri sp. nov. Plate 1, fig. 17.

Worker.—Length, 4 millimeters. Head longer than broad, broader behind than in front, occipital border straight. Eyes moderately convex, placed at the sides of head, well toward the front. Antennal scapes club-shaped, reaching to posterior occipital border. Antennal carinæ short, distance between them equal to diameter of scape at its apex. Anterior margin of clypeus concave; mandibles triangular, apical borders toothed.

Thorax in profile moderately convex. Epinotal declivity oblique. Node of petiole as long as high, from above square, truncated in front, transversely rounded above. Basal segment of gaster separated from the rest of the gaster by a deep constriction. Gaster comparatively long.

Densely punctured. Head coarsely rugose, finer on the remainder of the body. Covered with fine recumbent pile. Hairs suberect, scattered, more abundant on scape and abdomen.

Brownish black throughout. Undersides of flagellum and distal ends of femora reddish brown.

BASILAN (*Baker*), 1 worker.

Subfamily PONERINÆ Lepeletier

Tribe AMBLYOPONINI Forel

Genus MYSTRIUM Roger

Mystrium camillæ Emery.

Mystrium camillae EMERY, Ann. Mus. Stor. Nat. Genova 10 (1889) 491, figs. 1–3.

Type locality: Birmania.

LUZON, Laguna Province, Los Baños (*Williams*), 8 workers.

Genus STIGMATOMMA Roger

Stigmatomma rothneyi Forel.

Stigmatomma rothneyi FOREL, Journ. Bombay Nat. Hist. Soc. Zool. 13 (1900) 55–56.

Type locality: India (*Rothney*).

LUZON, Laguna Province, Los Baños and Mount Maquiling (*Wiliams*), 37 individuals including males, females, and workers.

Stigmatomma (Fulakora) luzonicum sp. nov. Plate 1, fig. 18.

Female.—Length, 3.5 millimeters. Head in front as broad as long, broader in front than behind, trapezoidal, sides nearly straight, occipital border transverse, frontal groove feeble. Eyes small, placed on the sides at posterior one-third of head. Antennal carinæ approximate, diverging behind. Scapes short, barely reaching to eyes. Joints of flagellum, excepting 1 and 11, transverse. Anterior margin of clypeus convex and armed with six bifid teeth. Mandibles two-thirds as long as head, thickened basal portion with six teeth, the most apical trifid.

Thorax rectangular, twice as long as broad. Basal portion of epinotum rounding into apical portion, lateral angles of which are margined, the disk thus formed concave. Node cuboidal, frontal surface rectangularly truncated, with anterior lateral angles slightly rounded, ventral protuberance small. Abdomen as long as thorax. Legs rather long and femora slightly thickened.

Subopaque. Head punctate-rugose, thorax and abdomen shining. Declivity of epinotum smooth. Covered with a fine gray pile. Hairs gray, erect, scattered; more abundant on antennæ, legs, and gaster.

Reddish brown. Occiput black; mandibles, clypeus, antennæ, legs, and apical segments of abdomen reddish yellow.

LUZON, Laguna Province, Los Baños (*Baker*), 1 dealated female.

Stigmatomma (Fulakora) williamsi sp. nov. Plate 1, fig. 19.

Worker.—Length, 5.5 millimeters. Head moderately convex above, rounded on sides, broader in front than behind, with posterior lateral angles rounded, occipital border straight. Anterior lateral angles of head behind base of mandibles provided with a tooth. Eyes minute, placed at sides on upper half of head. Midway of the longitudinal suture on the front is a pit that resembles an ocellus. Antennal carinæ close together. Joints of flagellum distinct, first and eleventh longer than broad. Anterior margin of clypeus convex, provided with a single row of teeth, the most apical four teeth bifid. Apical tooth acute and curved.

Thorax twice as long as broad, promesonotal suture deep, mesoepinotal suture not prominent, declivity of epinotum oblique, basal and apical portions continuous through a gradual curve, apical surface of epinotum broadened with marginate sides. Node of petiole from above slightly longer than broad,

truncated anteriorly, rounded above and on sides; truncated surface slightly concave, much narrower below. Gaster large, very long, basal segment one-third as long as the remainder.

Rugose. Head and dorsal part of thorax and abdomen finely and closely punctured. Mandibles striated at base, with smooth apex. Pleuræ finely and vertically striated. Node and gaster shining.

Covered with sparse erect gray hairs, more abundant on antennæ and abdomen. Fine gray pile covers all parts of body.

Reddish brown. Antennæ, legs, and apical segments of gaster yellowish.

Female.—Length, 6 millimeters; dealated. Very similar to worker, with the usual sexual modifications. Teeth on clypeus crowded together and the number not distinct; bifid as in the worker. Pronotum narrower in front. Pilosity and color as in the worker.

LUZON, Mountain Province, Baguio, 1,370 meters altitude (*Williams*), 13 workers and 2 females.

Genus MYOPOPONE Roger

Myopopone castanea Smith subsp. **maculata** Roger.

Myopopone maculata ROGER, Berl. Ent. Zeitschr. 5 (1861) 50. Type locality, Ceylon.

Myopopone castanea Smith subsp. *maculata* WHEELER, Bull. Mus. Comp. Zool. 43, No. 3 (1919) 50. Type locality, Ceylon.

LUZON, Laguna Province, Los Baños (*Williams; Baker*), workers and females; Mount Maquiling (*3286, 9183, 3285 Baker*), females. MINDANAO, Dapitan (*12133 Baker*), female: Lanao, 1 female from Staudinger and Bang-Haas. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

One female taken at light. A female and ten workers nesting beneath the ground in a dead stump. The workers vary in length from 7.5 to 10 millimeters.

Myopopone castanea Smith var. **bakeri** Viehmeyer.

Myopopone castanea Smith var. *bakeri* VIEHMEYER, Ent. Mitteil. 5 (1916) 283. Type locality, Leyte, Tacloban (*3285 Baker*).

One worker with the above number and locality was received from the Bureau of Science, Manila. The number corresponds with that of a female of *M. castanea* subsp. *maculata*. A

further study of the material from Leyte may show that this is merely one of the small workers of the preceding subspecies.

Tribe PLATYTHYREINI Emery

Genus PLATYTHYREA Roger

Platythyrea inermis Forel.

Platythyrea inermis FOREL, Philip. Journ. Sci. § D 5 (1910) 122. Type locality, Luzon, Montalban Gorge (*C. S. Banks*).

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros (*Chapman*).

A nest was found in the trunk of a dead tree fern. Also a few individuals on the ground near by. The collection consists of males, workers, and pupæ.

Platythyrea coxalis Emery.

Platythyrea coxalis EMERY, Rev. Suiss. Zool. (1893) 189, nota. Type locality, Malucca, Perak.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Nineteen individuals, one of which was a male, were nesting on the ground in a hollow dead branch.

Platythyrea coxalis Emery var. **philippinensis** Viehmeyer.

Platythyrea coxalis var. *philippinensis* VIEHMEYER, Ent. Mitteil. 5 (1916) 283. Type locality, Luzon, Los Baños (*1234 Baker*).

LUZON, Laguna Province, Los Baños (*Williams*), 22 workers. GUIMARAS, Bureau of Science collection, 1 worker. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), 2 females, 1 male, and 4 workers.

Platythyrea maquilingi sp. nov. Plate 2, figs. 1 and 2.

Worker.—Length, 6 millimeters. Head rectangular, sides feebly rounded, occipital border very feebly concave, much broader posteriorly than in front. Front strongly convex. Eyes small, placed at the middle transverse line of head. Scapes of antennæ reaching just beyond corner of head. Flagellar joints 6 to 10 transverse. Antennal carinæ far apart. Clypeus and front forming a strong anterior-posterior convex curve without distinct suture. Anterior margin of clypeus convex. Mandibles triangular, apical border broad and minutely denticulate throughout; apical tooth curved.

Thorax one-third as broad as long, premesonotal suture strongly marked, mesoepinotal suture obsolete. Epinotal declivity high, oblique, and concave, lateral angles smooth and rounded. Node of petiole slightly longer than broad. Anterior surface rounded, posterior surface truncated, without lobes above. Gaster large and oval. Basal segment broader than long. Posterior coxæ with blunt tooth.

Subopaque, densely and finely punctured, much obscured by fine grayish pubescence. Erect hairs scattered over head and abdomen.

Black; mandibles, antennæ, legs, and apical segments of gaster reddish brown.

Resembles *P. inermis* Forel, but is smaller and has the posterior coxæ toothed.

LUZON, Laguna Province, Mount Maquiling (*Baker*), 3 workers.

Tribe ECTATOMINI Emery

Genus **STICTOPONERA** Mayr

Stictoponera coxale Roger.

Ponera coxale ROGER, Berl. Ent. Zeitschr. 4 (1860) 308. Type locality, Ceylon (*H. Nietner*).

LUZON, Laguna Province, Paete, Sarai (*R. C. McGregor*), 1 worker; Los Baños (*Williams*), 5 workers; Mount Maquiling (*2069 Baker*), I worker. MINDANAO, Kolambugan (*Banks*), BASILAN (*12133 Baker*), 1 male. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Workers of this species were found foraging singly on plants in a cool damp ravine, near a small spring. Complete colony found May, 1924, nesting under moss on a large stone.

Stictoponera menadensis var. bicolor Emery.

Stictoponera menadensis subsp. *bicolor* EMERY, Ann. Mus. Stor. Nat. Genova 27 (1859) 493. Type locality, Birmania.

LUZON, Laguna Province, Mount Maquiling (*2070 Baker*), 1 male.

Genus **CHALCOPONERA** Emery

Chalcoponera victoria Ern. Andre var. **andrei** var. nov. Plate 2, figs. 3 and 4.

Worker.—Length, 4.5 millimeters. Head about as broad as long, broadest through occiput. Occipital corners feebly

rounded, occipital border very little concave. Eyes large and convex, placed posterior to middle transverse line of head. Antennal carinæ far apart, borders parallel and extending about its breadth beyond corners of head. Joints of funiculi longer than broad. Joints 1 and 11 twice as long as broad. Clypeus convex longitudinally, separated from front by a feeble suture. Mandibles large, triangular, inner apical margin minutely dentate.

Prothorax not as wide as head, twice as long as broad, angulate ventrally at sides, with a distinct tooth. Promesonotal suture distinct, mesoepinotal suture faint or obsolete. Basal part of epinotum rounding into apical portion. Node from above transversely oval, rounded in front, flat behind, and as high as basal segment of gaster, produced on its anterior ventral surface into a trapezoidal spine.

Abdomen as broad as prothorax, twice as long as broad. Anterior legs with pectinate spine. Middle and posterior pair with simple spine. Claws with tooth on basal inner half.

Rugose. Mandibles smooth, obsoletely striate, and covered with punctures. Head longitudinally cribrate on clypeus and front. Antennal sulci finely striate. Sides of head and occiput strongly reticulate-cribrate. Scape finely striated. Thorax strongly rugose, declivity of epinotum transversely striated. Node of pedicel strongly rugose in front, posterior surface finely rugose. Abdominal segments 1 and 2 finely striated, the striæ diverging concentrically from mid-dorsal longitudinal line.

Covered with erect scattered hairs, more abundant on head and apical segments of abdomen.

Reddish brown. Legs lighter red. Mandibles and antennæ reddish yellow.

This genus is Australian. On examining the material in the senior author's collection we found this undescribed variety from the mountains of Victoria. Dr. F. X. Williams took one specimen at Los Baños, Luzon, Philippine Islands, that cannot be distinguished from the specimens from Victoria. It would seem probable that this species has been introduced into the Philippines on vegetation shipped from Australia to the College of Agriculture at Los Baños.

Type locality: Victoria Mountains, Australia. Several workers.

LUZON, Laguna Province, Los Baños (*Williams*), 1 worker.

Tribe PONERINI Forel

Genus CENTROMYRMEX Mayr

Centromyrmex feæ Emery.

Spalacomyrmex feæ EMERY, Ann. Mus. Stor. Nat. Genova 27 (1889) 491, pl. 10, figs. 11–15. Type locality, Birmania; Bhamô.

LUZON, Laguna Province, Los Baños, Mount Maquiling (*Baker*), 2 females. BASILAN (*Baker*), 1 female and 1 male.

Genus HARPEGNATHOS Jerdon

Harpegnathos venator Smith var. **rugosus** Mayr.

Harpegnathos venator Smith var. *rugosus* MAYR, Verh. Zool. Bot. Ges. Wien 12 (1862) 732. Type locality, Hongkong.

LUZON, Laguna Province, Mount Maquiling (*Baker*), 1 specimen.

This single specimen differs from two specimens of typical *H. venator* Smith, from Hongkong and Assam, in the senior author's collection, and from Mayr's description of the subsp. *rugosus* in the color of the node and hind legs in which the brown color is replaced by black. The sculpture is that of *rugosus*. Perhaps the Philippine specimen represents a distinct variety.

Harpegnathos macgregori sp. nov.

Worker.—Length, 20 millimeters. Head without mandibles in front as broad as long. Antennal scapes filiform, extending one-fifth their length beyond corners of head. Joints of flagellum longer than broad, subequal. Mandibles articulating with exterior angles of head, apical border very long, approximate throughout and provided with two rows of teeth which point toward base of mandibles.

Thorax long and cylindrical, promesonotal suture prominent, mesoepinotal suture obsolete. Epinotal declivity oblique, relatively short. Node of petiole two and one-fourth times as long as broad, higher behind than in front, rounded on front and sides. Basal segments of gaster about one-third the length of entire gaster.

Opaque; head, pronotum, and mesonotum coarsely, longitudinally striated. Epinotum with transverse striæ. Node rugosely punctate, gaster finely punctate, interspersed with coarser punctures.

Body covered with sparse erect pale gray hairs. Black; mandibles, legs, flagellum, and dorsal spot on first and second segments of gaster yellow.

BILIRAN (*McGregor*), 1 specimen.

Genus **ODONTOPONERA** Mayr

Odontoponera transversa Smith. Plate 2, fig. 5.

Ponera transversa F. SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 63. Type locality, Singapore (*A. R. Wallace*).

Odontoponera transversa EMERY, Ann. Soc. Ent. France (1893) 262; WHEELER, Bull. Am. Mus. Nat. Hist. 24 (1909) 339; FOREL, Philip. Journ. Sci. § D 5 (1910) 122; VIEHMEYER, Ent. Mitteil. 5 (1916) 285.

LUZON, Rizal Province, Antipolo (*E. Simon*): Laguna Province, Los Baños (*Williams; Baker*); Mount Banahao (*Williams*); Paete, Sarai (*McGregor*); Mount Maquiling (*Baker*). Bantayan (*L. E. Griffin*). ROMBLON (*H. M. Smith and L. Morato*). PANAY, Iloilo Province, Iloilo (*L. Ortaliz*): Antique Province, Tibiao (*McGregor*). BASILAN (*Baker*). JOLO (*A. C. Duyag*). NEGROS, Occidental Negros Province, Maao (*C. S. Banks*): Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

This ant is very common on the sides of the Horns of Negros from 300 to 600 meters. It lives in the ground, the entrance to the nest often unprotected, and in the barren and worn trails. It is especially fond of termites and is often seen raiding their colonies.

Odontoponera transversa Smith var. **biconcentrica** var. nov. Plate 2, fig. 6.

Worker.—Length, 12 millimeters. This variety can be distinguished from *O. transversa* Smith, the only known species of the genus, by the concentric arrangement of the striæ on the pronotum.

BASILAN (*Baker*), a single worker.

Genus **DIACAMMA** Mayr

Diacamma rugosum Le Guillou.

Ponera rugosa LE GUILLOU, Ann. Soc. Ent. France 10 (1840) 318. Type locality, Borneo (Voyage of the Astrolabe and Zelee).

Ponera versicolor F. SMITH, Cat. Hym. Insect. Brit. Mus. 6 (1858) 87 (*o. d. t. l.* Philippines).

Diacamma rugosum Le Guillou; ROGER, Berl. Ent. Zeitschr. 6 (1863) 16; ASHMEAD, Proc. U. S. Nat. Mus. 8 (1904) 153, No. 1387; WHEELER, Bull. Am. Mus. Nat. Hist. 26 (1909) 338.

Philippines; F. Smith.

Diacamma rugosum Le Guillou var. **sculptum** Jerdon.

Ponera sculpta JERDON, Madras Journ. Lit. Soc. 17 (1851) 117. Type locality, Ceylon.

Diacamma rugosum subsp. *sculptum* WHEELER, Bull. Ann. Mus. Nat. Hist. 26 (1909) 338.

LUZON, Manila (*W. A. Stanton*): Laguna Province, Mount Maquiling (*Williams*): Mountain Province, Baguio, 600 to 1,800 meters altitude (*Williams*); Trinidad (*H. M. Smith*). Bantayan Bay; Setanki Island; Sibutu Island (*H. M. Smith*).

Diacamma rugosum Le Guillou subsp. **sculptum** var. **vagans** Smith.

Ponera vagans F. SMITH, Journ. Proc. Linn. Soc. London Zool. 4 (1860) Suppl. 103. Type locality, Batacian Islands.

Diacamma rugosum subsp. *sculptum* var. *vagans* WHEELER, Bull. Am. Mus. Nat. Hist. 26 (1909) 339.

PAPAGON ISLAND, near Luzon (*H. M. Smith*). LUZON, Manila (*R. Thaxter*): Laguna Province, Los Baños (*Baker*); Calauang (*McGregor*), Bureau of Science No. 14188. NEGROS, Oriental Negros Province, Dumaguete (*Chapman*).

This species seems to vary considerably and will have to be studied more in detail in the field before we can draw final conclusions in regard to its status.

Diacamma rugosum geometricum Smith.

Ponera geometrica F. SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 67. Type locality, Singapore (*A. R. Wallace*).

Diacamma rugosum subsp. *geometricum* FOREL, Philip. Journ. Sci. § D 5 (1910) 122; WHEELER and CHAPMAN, Psyche 29 (1922) 203–211.

LUZON, Laguna Province, Paete, Sarai (*McGregor*); Los Baños (*Williams*): Cagayan Province, Port San Vicente Hills (*H. M. Smith*): Mountain Province, Mount Pulog (*H. M. Curran*), Bureau of Science No. 10280. MINDANAO, Davao Province, Davao (*Copeland*). PANAY, Iloilo Province, Iloilo (*L. Ortaliz*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros from sea level to 600 meters altitude (*Chapman*).

About fifty collections of this species were made by the junior author. During 1922 two colonies were found with males, one of which was in copulation with a worker.

Specimens of *D. geometricum* agree perfectly with those in the senior author's collection from North Borneo and Celebes, but differ from those from Hongkong and Burma in the shape of the petiole and length of the spines.

Diacamma rugosum subsp. geometricum var. vidipurpureum Emery.

Diacamma rugosum subsp. *geometricum* var. *vidipurpureum* EMERY, Ann. Soc. Ent. France (1893) 261. Type locality, Luzon, Antipolo (*E. Simon*).

Diacamma rugosum subsp. *geometricum* var. *vidipurpureum* WHEELER, Bull. Am. Mus. Nat. Hist. 26 (1909) 338; FOREL, Philip. Journ. Sci. § D 5 (1910) 122.

LUZON, Manila (Staudinger and Bang-Haas): Laguna Province, Los Baños (*Williams*); Paete, Sarai (*McGregor*); Mount Banahao (*Williams; Baker;* Staudinger and Bang-Haas): Bataan Province, Limay (*Boettcher*): Ilocos Norte Province (*Banks*): Benguet and San Vicente Hills (*H. M. Smith*). BANTAYAN ISLAND (*L. E. Griffin*). MARINDUQUE and SANTA CRUZ ISLANDS (*H. M. Smith*). MINDORO, Calapan (Staudinger and Bang-Haas). MASBATE, Port Cataingan (*H. M. Smith*). ROMBLON, Romblon (*L. Morato*). SAMAR, Basiao Island (*H. M. Smith*). PANAY, Antique Province, Tibiao and Culasi (*McGregor*). CEBU, Cebu (*Williams*). NEGROS, Oriental Negros Province, Dumaguete (*Chapman*), a colony with 16 workers, 5 pupæ, and 4 larvæ; also numerous isolated workers on other occasions.

Diacamma palawanicum Emery.

Diacamma palawanicum EMERY, Ann. Mus. Stor. Nat. Genova 40 (1900) 666. Type locality, Palawan, Philippine Islands.

Diacamma palawanicum var. concentricum var. nov. Plate 2, figs. 7 and 8.

Worker.—Length, 16 millimeters. Head longer than broad, broadest in front, occipital corners and border rounded. Eyes prominent, convex. Antennæ filiform, joints 2 and 3 of the funiculus subequal. Clypeus convex and almost angular at the middle anterior border.

Thorax long, slender, epinotal declivity oblique; node of pedicel higher than long, as broad as long, spines one-half as long as node is high; far apart and pointing backward and outward. Node flat anteriorly, truncated posteriorly, concavity between spines reaching one-third the distance from posterior to anterior

border. Distance between spines equal to one-third the breadth of basal segment of gaster.

Head and thorax striated, gaster smooth. Mandibles striated, clypeus multicarinate or longitudinally cribrate. Occiput longitudinally striated but none of the striæ pass from occipital border forward to clypeus; all diverge to frontal carinæ.

Striæ on pronotum concentric. Epinotal declivity submarginate, striæ transverse. Node of petiole striate, striæ beginning above from base of spines of node and continuing horizontally throughout.

Covered with fine gray pile, with sparse erect gray hairs, scattered rather uniformly over body, longer and more abundant on front of head and apical segments of gaster.

Black; mandibles, antennæ, and legs reddish brown. Differs from the type in having the striæ of the pronotum arranged concentrically instead of longitudinally.

PALAWAN, Binaluan (*G. Boettcher*); Malampaya (*W. Schultze*), Bureau of Science No. 14009. Described from five workers.

Diacamma panayensis sp. nov. Plate 2, figs. 9 and 10.

Worker.—Length, 16 millimeters. Head a little longer than broad. Eyes convex, prominent, placed well back on sides of head. Antennæ filiform, funicular joints 2, 3, and 4 subequal. Anterior margins of clypeus rounded, convex; mandibles strongly toothed.

Thorax slender, base of epinotum compressed, declivity oblique and feebly concave. Node of petiole longer at base than above; as long as wide. Anterior face concave, posterior face flat, lateral corners rounded. Spines about one-fourth the height of node. Gaster large, as long as thorax and head combined.

Opaque. Mandibles striate, occiput longitudinally striate, the striæ passing from occipital border between eyes and antennal carinæ to clypeus. Pronotum transversely striated. The striæ on the node of the petiole begin independently of the spines and run more or less horizontally around the node throughout. Basal segment of abdomen smooth.

Pilosity lacking, excepting on head and apical segments of gaster. Gaster smooth and shining and covered with a fine grayish pile.

Black; mandibles, clypeus, flagellum, legs, and sting reddish brown.

This species resembles *D. palawanicum* Emery in having the basal segment of the gaster smooth, but differs from it in the transverse striæ on the pronotum and the shape of the node of the petiole.

PANAY, Antique Province, Culasi (*McGregor*), 6 workers.

Diacamma baguiensis sp. nov. Plate 2, figs. 11 and 12.

Worker.—Length, 11 millimeters. Head very slightly longer than broad, sides straight, occipital corners and border rounded. Antennæ long, filiform; funicular joints 2, 3, and 4 subequal. Median lobe of clypeus angular, its anterior margin rounded; frontal carinæ short and approximate. Mandibles stout, triangular, bearing several teeth on the apical border.

Thorax elongate, narrow, more than twice as long as broad, declivity of epinotum obliquely truncated. Node in front as high as long, one-third higher behind. Anterior face concave, posterior face broad; as broad as its greatest diameter; concave; spines short, pointing backward and inward. Abdomen long and rather massive.

Mandibles finely striated. Head and occiput longitudinally striate, all the striæ meeting the antennal carinæ posterior to middle line of head. Pronotum transversely striate. Epinotal striæ concentric with anterior part open at the mesoepinotal suture. Epinotal suture transversely striated. Striæ of node begin with spines and run horizontally throughout. Basal segment of gaster covered with prominent striæ which run very nearly transversely throughout.

Pilosity wanting, excepting a few scattered hairs on head and apical segments of gaster. Entire body covered with a pale yellowish pile.

Black; antennæ, legs, and apical segment of gaster reddish brown.

LUZON, Mountain Province, Baguio, 1,370 meters altitude (*Chapman*), 2 workers.

Genus ECTOMYRMEX Mayr

Ectomyrmex annamitus Ern. Andre.

Ectomyrmex annamitus ERN. ANDRE, Rev. Ent. 11 (1892) 48. Type locality, Birmania.

LUZON, Laguna Province, Mount Maquiling (*Baker*), 3 females.

Genus **BOTHROPONERA** Mayr

Bothroponera glabripes Emery.

Bothroponera glabripes EMERY, Ann. Soc. Ent. France (1893) 262; WHEELER, Bull. Am. Mus. Nat. Hist. 26 (1909) 339. Type locality, Mindanao, Philippines.

Bothroponera tridentata Smith.

Pachycondyla tridentata SMITH, Cat. Hym. Brit. 6 (1858) 106. Type locality, Borneo, Sarawak.

TAWITAWI (*A. C. Duyag*). JOLO (*Duyag*).

Several workers from the above localities measure 17 to 19 millimeters.

Bothroponera williamsi sp. nov. Plate 2, figs. 13 and 14.

Worker.—Length, 9.5 millimeters. Head as broad as long, sides feebly rounded, occipital border very slightly concave. Eyes small, situated just posterior to base of mandibles. Antennal scapes cylindrical, reaching barely to corners of head. Joints 2 to 10 of flagellum as broad as long. Anterior margin of clypeus rounded, carinate at middle line. Mandibles stout, apical border armed with seven strong teeth.

Thorax two-thirds as broad as long, broader in front than behind, promesonotal suture prominent, mesoepinotal suture obsolete. Epinotal declivity oblique, lateral borders emarginate. Node of petiole high, twice as broad as long, convex in front, posterior surface flat, above transversely rounded. Abdomen moderately large.

Opaque; mandibles striate on their outer margins and sparsely covered with foveolate punctures. Clypeus longitudinally rugose. Head and anterior part of thorax rugose. Base of epinotum cribrate, declivity transversely striate.

Covered with dense, erect, reddish yellow hairs, longest on clypeus, base of epinotum, and abdomen; sparse on antennæ and legs. A fine recumbent pile abundant on all parts of body excepting declivity of epinotum, anterior surface of gaster, and node.

Black; mandibles, clypeus, antennæ, legs, and apical segments of abdomen reddish.

LUZON, Laguna Province, Mount Maquiling (*Williams*), a single worker.

Genus EUPONERA Forel

Euponera (Trachymesopus) darwinii Forel **var. indica** Emery.

Euponera (*Trachymesopus*) *darwinii* Forel var. *indica* EMERY, Bull. Ent. Italy 31 (1900) 276, nota; VIEHMEYER, Ent. Mitteil. 5 (1916) 284. Type locality, Upper Burmah (*Doherty*).

LUZON, Laguna Province, Los Baños (*Baker and Williams*); Mount Maquiling (*Baker*): Ilocos Norte Province (*Banks*): Manila (*Banks*), Bureau of Science Nos. 4767, 6395, and 13258. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), males and females taken at light.

Euponera (Trachymesopus) stigma Fabr. **var. quadridentata** Smith.

Ponera quadridentata SMITH, Journ. Proc. Linn. Soc. London Zool. 3 (1858) 143. Type locality, Aru Islands.

LUZON, Laguna Province, Los Baños (*Baker and Williams*); taken by Williams in a rotten log in the forest; Mount Maquiling (*Baker*); San Antonio (*F. W. Foxworthy*), Bureau of Science No. 11481. BASILAN (*Baker*).

Euponera (Brachyponera) luteipes Mayr.

Ponera luteipes MAYR, Verh. Zool.-bot. Ges. Wien 12 (1862) 722. Type locality, Milu-Nicobar Islands (Novara Expedition).

LUZON, Rizal Province, Antipolo (*E. Simon*): Laguna Province, Los Baños (*Williams and R. Thaxter*); Mount Maquiling (*Williams*), 3 females from the summit; Mount Banahao, at 300 to 1,200 meters altitude (*Williams*). PALAWAN, Binaluan (*G. Boettcher*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 1,200 meters altitude (*Williams*).

Females taken at a light at 450 meters altitude by the junior author on a number of occasions.

Genus PONERA Latreille

Ponera moczaryi Emery.

Ponera moczaryi EMERY, Term. Fuzet. 23 (1900) 316–319, pl. 8, figs. 15–16. Type locality, New Guinea.

LUZON, Laguna Province, Los Baños (*Williams*), 8 workers. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros (*Chapman*), two colonies consisting of males and workers.

Ponera punctatissima Roger **subsp. schaunslandi** Emery.

Ponera punctatissima Roger subsp. *schaunslandi* EMERY, Zool. Jahrbuch Syst. 12 (1899) 239. Type locality, Island of Laysan.

LUZON, Manila (*R. Thaxter*).

Ponera confinis Roger var. **javana** Forel.

Ponera confinis Roger var. *javana* Forel, Mitt. Nat. Mus. Hamburg 22 (1905) 6. Type locality, Buitenzorg, Java (*K. Kraepelin*).

Luzon, Laguna Province, Mount Maquiling (*Williams*), 9 specimens from the summit; Los Baños (*Williams*), several workers. Negros, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), several colonies consisting of workers.

Ponera gleadowi Forel.

Ponera gleadowi Forel, in Emery Mem. Accad. Soc. Bolona (5) 5, 292, nota. Type locality, India (*Wroughton*).

Luzon, Laguna Province, Los Baños (*R. Thaxter*), 5 workers.

Genus **TRAPEZIOPELTA** Mayr

Trapeziopelta breviloba Wheeler.

Trapeziopelta breviloba Wheeler, Bull. Mus. Comp. Zool. Harvard 63 (1919) 143. Type locality, Borneo, Sandakan (*Baker*).

Basilan (*Baker*), 1 female.

Genus **LEPTOGENYS** Roger

Leptogenys (Leptogenys) maxillosa F. Smith.

Ponera maxillosa F. Smith, Cat. Hym. Brit. Mus. 6 (1858) 93. Type locality, Maurice Islands.

Panay, Antique Province, Culasi (*McGregor*).

Leptogenys (Leptogenys) pruinosa Forel.

Leptogenys pruinosa Forel, Journ. Bombay Nat. Hist. Soc. 13 (1900) 304. Type locality, Ceylon (*Bingham*).

Luzon, Manila (*R. Brown*). Negros, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), one worker.

Leptogenys (Lobopelta) peuqueti Andre.

Lobopelta peuqueti Andre, Rev. Ent. 6 (1887) 292. Type locality, Ceylon.

Luzon, Laguna Province, Los Baños (*Williams*). Negros, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Leptogenys (Lobopelta) peuqueti Andre var. watsoni Forel.

Leptogenys (Lobopelta) peuqueti Andre var. *watsoni* FOREL, Journ. Bombay Nat. Hist. Soc. 13 (1900) 309. Type locality, N. Burmah.

LUZON, Laguna Province, Los Baños (*Baker and Williams*). PANAY, Antique Province, Tibiao (*McGregor*). NEGROS, Oriental Negros Province, Dumaguete (*Chapman*).

Leptogenys (Lobopelta) diminuta F. Smith.

Ponera diminuta F. SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 69. Type locality, Borneo, Sarawak (*A. R. Wallace*).

PAPAGON ISLAND (*H. M. Smith*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), nesting in the trunk of a dead tree fern.

Leptogenys (Lobopelta) diminuta Smith var. opacinodis Emery.

Leptogenys diminuta Smith var. *opacinodis* EMERY, Ann. Mus. Stor. Nat. Genova 25 (1887) 433. Type locality, Sumatra.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), nesting in an old log.

Leptogenys (Lobopelta) chinensis Mayr.

Lobopelta chinensis MAYR, Verh. Zool.-bot. Ges. Wien 20 (1870) 265. Type locality, China.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 1,150 meters altitude (*Chapman*).

Foray crossing the trail. Some were carrying pupæ. The winged forms were taken at light at 450 meters altitude.

Leptogenys (Lobopelta) iridescens F. Smith.

Ponera iridescens SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 6. Type locality, Borneo, Sarawak (*A. R. Wallace*).

PALAWAN, Binaluan (*Boettcher*).

Workers agree well with Smith's description.

Leptogenys (Lobopelta) punctiventris Mayr.

Lobopelta punctiventris MAYR, Verh. Zool.-bot. Ges. Wien (1878) 665. Type locality, Sillim.

LUZON, Laguna Province, Los Baños (*Williams*). NEGROS, Oriental Negros Province, Dumaguete and on the Horns of Negros (*Chapman*).

Nesting in the ground at sea level. Taken from a foray crossing the trail at 450 meters altitude.

Tribe ODONTOMACHINI Mayr

Genus ANOCHETUS Mayr

Anochetus punctiventris var. oceanus Emery.

Anochetus punctiventris subsp. *oceanus* EMERY, Term. Fuzet. 20 (1897) 597. Type locality, New Caledonia.

LUZON, Laguna Province, Los Baños (*Williams*).

Genus ODONTOMACHUS Latreille

Odontomachus infandus F. Smith.

Odontomachus infandus SMITH, Cat. Hym. Brit. Mus. 6 (1858) 81. Type locality, Luzon, Philippines.

NEGROS, Occidental Negros Province (*Banks*), Bureau of Science No. 6908.

Odontomachus papuanus subsp. philippinus Emery.

Odontomachus papuanus subsp. *philippinus* EMERY, Rev. Suiss. Zool. 1 (1893) 203. Type locality, Philippines.

LUZON, Manila (*E. Simon*). ROMBLON (*H. M. Smith*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Odontomachus banksi Forel.

Odontomachus banksi FOREL, Philip. Journ. Sci. § D 5 (1910) 121. Type locality, Luzon, Province of Laguna, Mount Banajao, P. I. *Charles S. Banks* collector.

LUZON, Mount Banahao (*Baker and Williams*). Bureau of Science No. 7181, collected by C. S. Banks.

Odontomachus saevissimus F. Smith.

Odontomachus saevissimus SMITH, Cat. Hym. Brit. Mus. 6 (1858) 80. Type locality, Malluca.

LUZON, Cagayan Province, Port San Vicente Hills (*H. M. Smith*). ROMBLON (*H. M. Smith and L. Morato*).

Odontomachus haematoda Linnæus.

Formica haematodes LINNÆUS, Syst. Nat. ed. 10, 1 (1758) 528. Type locality, South America.

LUZON, Manila (*E. Simon*) : Laguna Province, Los Baños (*Baker and Williams*). MASBATE, Port Cataingan (*H. M. Smith*). ROMBLON (*H. M. Smith and L. Morato*). NEGROS, Oriental Negros Province, Dumaguete, sea level to an altitude of 900 meters (*Chapman*).

ILLUSTRATIONS

Plate 1

Fig. 1. *Aenictus luzoni* sp. nov., lateral view.
2. *Aenictus luzoni* sp. nov., dorsal view.
3. *Aenictus camposi* sp. nov., lateral view.
4. *Aenictus camposi* sp. nov., dorsal view.
5. *Cerapachys rufithorax* sp. nov., lateral view.
6. *Cerapachys rufithorax* sp. nov., dorsal view.
7. *Cerapachys rufithorax* sp. nov., head, front view.
8. *Cerapachys negrosensis* sp. nov., lateral view.
9. *Cerapachys nitida* sp. nov., lateral view.
10. *Cerapachys nitida* sp. nov., head, front view.
11. *Cerapachys muiri* sp. nov., lateral view.
12. *Cerapachys muiri* sp. nov., head, front view.
13. *Lioponera luzuriagæ* sp. nov., lateral view.
14. *Lioponera luzuriagæ* sp. nov., dorsal view.
15. *Lioponera bicolor* sp. nov., lateral view.
16. *Lioponera bicolor* sp. nov., dorsal view.
17. *Lioponera bakeri* sp. nov., lateral view.
18. *Stigmatomma* (*Fulakora*) *luzonicum* sp. nov., lateral view.
19. *Stigmatomma* (*Fulakora*) *williamsi* sp. nov., lateral view.

Plate 2

Fig. 1. *Platythyrea maquilingi* sp. nov., lateral view.
2. *Platythyrea maquilingi* sp. nov., head, front view.
3. *Chalcoponera victoria* Ern. Andre var. *andrei* var. nov., lateral view.
4. *Chalcoponera victoria* Ern. Andre var. *andrei* var. nov., head, front view.
5. *Odontoponera transversa* Smith, prothorax, dorsal view.
6. *Odontoponera transversa* Smith var. *biconcentrica* var. nov., prothorax, dorsal view.
7. *Diacamma palawanicum* Emery var. *concentricum* var. nov., petiole, lateral view.
8. *Diacamma palawanicum* Emery var. *concentricum* var. nov., petiole, front view.
9. *Diacamma panayensis* sp. nov., petiole, lateral view.
10. *Diacamma panayensis* sp. nov., petiole, front view.
11. *Diacamma baguiensis* sp. nov., petiole, lateral view.
12. *Diacamma baguiensis* sp. nov., petiole, front view.
13. *Bothroponera williamsi* sp. nov., lateral view.
14. *Bothroponera williamsi* sp. nov., head, front view.

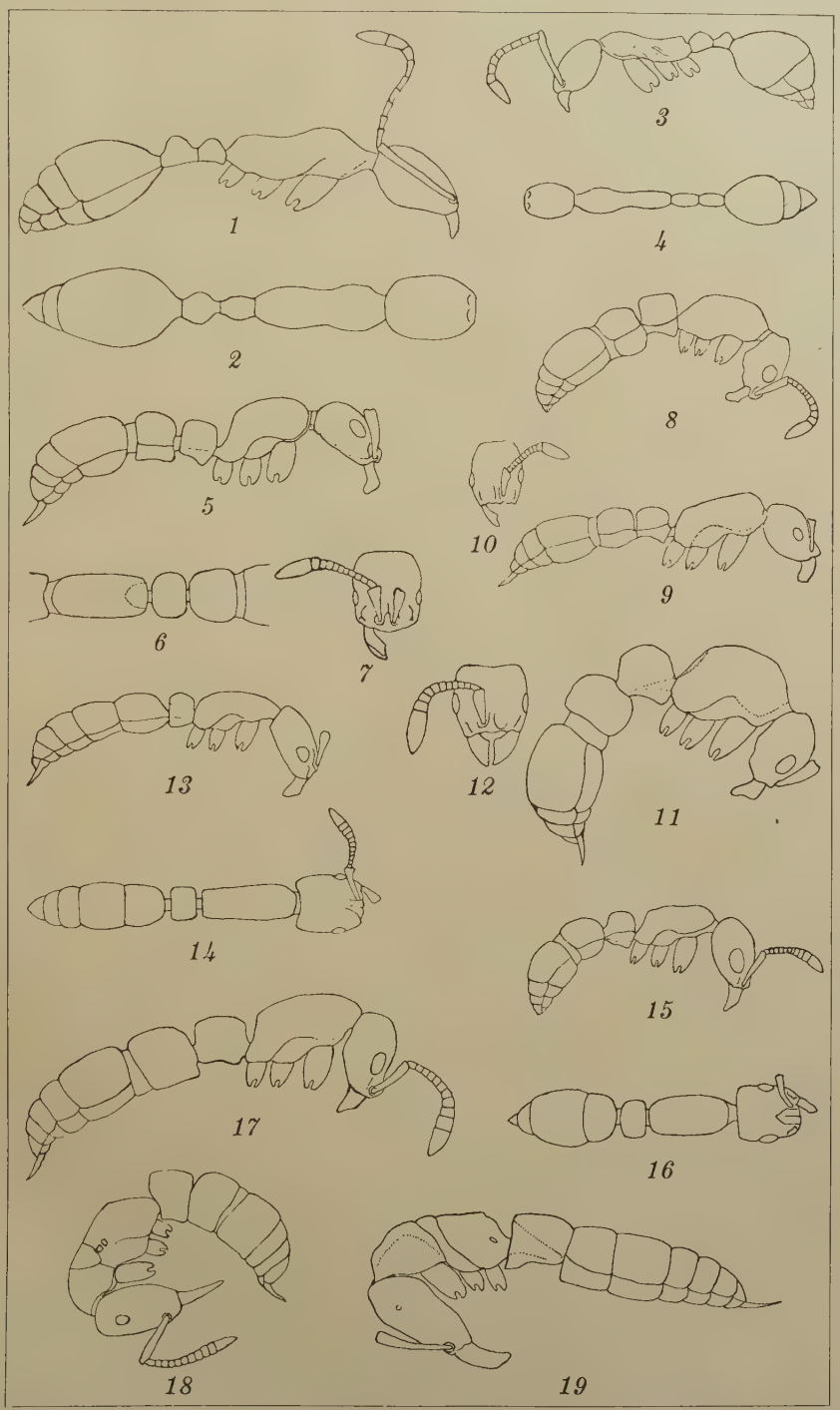

PLATE 1. PHILIPPINE ANTS.

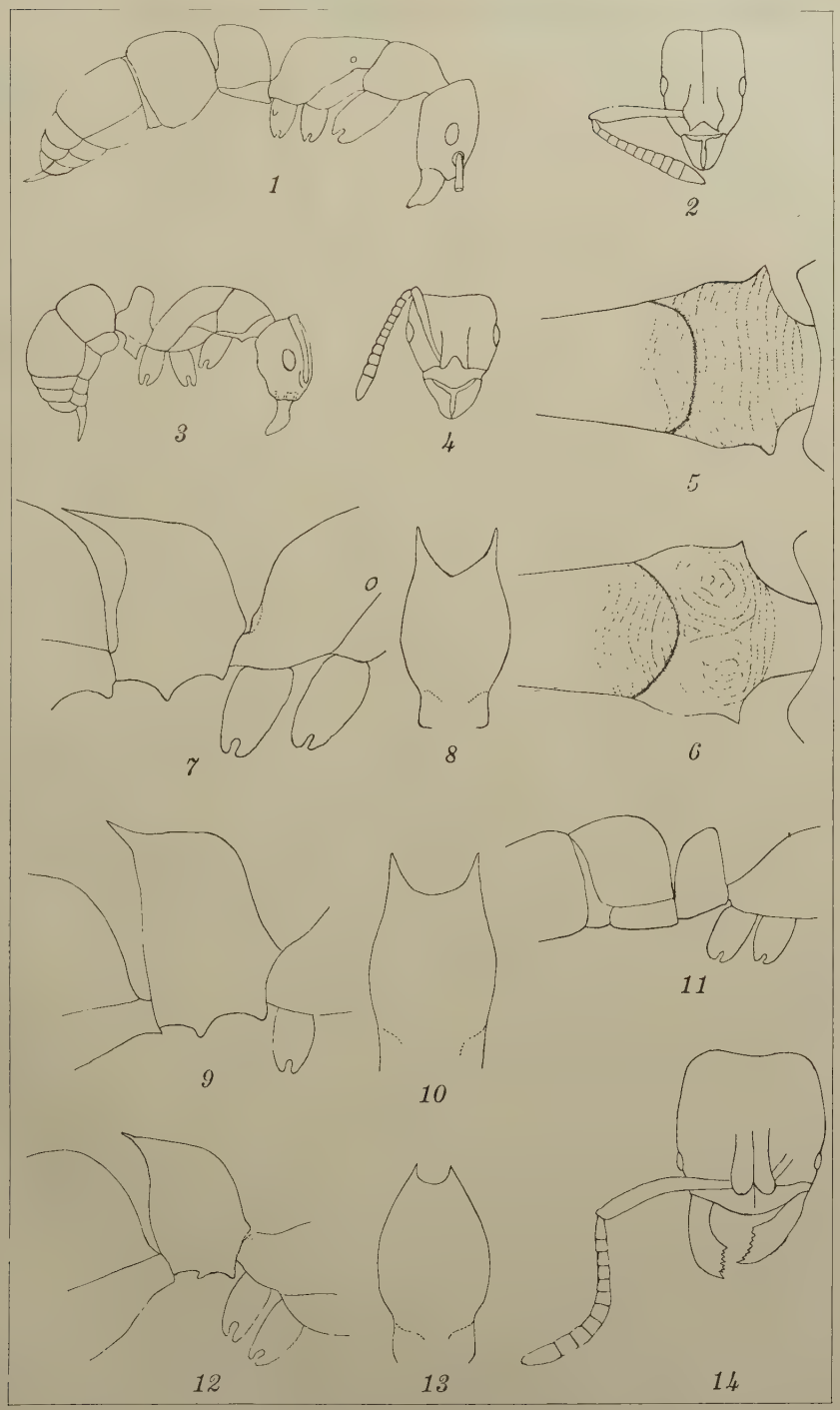

PLATE 2. PHILIPPINE ANTS.

NOTES ON JAPANESE LEPIDOPTERA AND THEIR LARVÆ: PART VIII

By A. E. WILEMAN

Fellow of the Entomological Society of London

TWO COLORED PLATES

HETEROCERA

DREPANIDÆ

Genus ORETA Walker

Oreta WALKER, Cat. Lep. Het. 5 (1855) 1166.

Oreta pulchripes Butler.

Plate 1, fig. 1, larva; fig. 2, head and thoracic segments; fig. 3, food plant. Larva of forma *calceolaria* Butler.

Japanese names: *Oreta pulchripes, ashibeni-kagiba; O. calceolaria, kiobi-kagiba, kimadara-kagiba.*

Oreta pulchripes BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 477; Ill. Typ. Lep. Het. 2 (1878) 15, pl. 25, fig. 7; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 57; LEECH, Proc. Zool. Soc. London (1888) 650, No. 332; Trans. Ent. Soc. London (1898) 371, No. 332; STAUDINGER, Rom. Mém. Lép. 6 (1892) 333; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 128, No. 1046; NAGANO, Nihon Rinshiroi Hanron (Jap.) (1905) 166; (*purchripes*!); Bull. Nawa Ent. Lab. 2 (1917) 41, pl. 3, figs. 10, 11 ♂ [Nawa Konchū Kenkyūjō Hokoku (Jap.)] 131; MATSUMURA, Cat. Insect. Jap. 1 (1905) 49, No. 397; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1909) suppl. 1, 132, No. 232, pl. 13, fig. 6, ♀; STRAND, Seitz's Macrolep. Faun. Pal. 2 (1911) 205, pl. 22, fig. *i*, sex?

Oreta calceolaria BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 478; Ill. Typ. Lep. Het. 2 (1878) 15, pl. 25, fig. 4; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 58; LEECH, Proc. Zool. Soc. London (1888) 650, No. 333; GRAESER, Berl. Ent. Zeit. (1888) 136; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 128, No. 1046*a*; MATSUMURA, Cat. Insect. Jap. 1 (1905) 49, No. 398; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1909) suppl. 1, 131, No. 230, pl. 13, fig. 4, ♀; STRAND, Seitz's Macrolep. Faun. Pal. 2 (1911) 205, pl. 22, fig. *i*, sex?

Oreta loochooana SWINHOE, Trans. Ent. Soc. London (1902) 591.

The larva figured (Plate 1, fig. 1) was taken in June, 1902 (figured, June 17), at Hakodate, Oshima Province, Hokkaido

(Yezo), on *yabu-murasaki,* also named *kome-gome* (*Callicarpa mollis* Siebold and Zuccarini). It pupated on June 21, 1902, and a female imago of the form *calceolaria* emerged on July 8, 1902. Graeser found the larva of *pulchripes* at Vladivostok in June on *Viburnum* and bred eighty-four specimens of both *Oreta pulchripes* and *O. calceolaria* from the same larvæ. I describe the larva from my artist's original figure as follows:

Larva.—Length from head to end of anal tail, about 35 millimeters. Head bifurcated, grayish brown; dorsally yellowish gray; laterally dark brown; a violet-gray patch extending mediolaterally to the prolegs from segment 7 to segment 10; a white subdorsal stripe from segment 2 (next head) to segment 6 from whence the stripe is faintly continued to the anal segment; a broad white spiracular stripe from segment 2 to segment 4; two white stripes, on segments 5 and 6, conjoined at the base by a semicircle and directed obliquely upward and forward; a whitish stripe from segment 11 to anus inclosing two, small, brown diamond-shaped spots; anal segment prolonged into a tail, about 7 millimeters in length; (single ? or paired ?) acuminate dorsal process on segment 4; legs and prolegs brownish.

Imago.—Staudinger [1] remarks:

> According to Graeser there is no doubt that *pulchripes* [Butler] is merely the far rarer reddish brown form (aberration) of the reddish brown and yellow coloured *calceolaria* Butler, which would have been extremely probable, even without the proof afforded by breeding and by the discovery by Graeser of both forms in copula.

Strand, quoting Graeser, remarks as follows:

> Larvae in June on Viburnum. They are marbled with grey, brown and reddish and are said to have the shape of the larva of Drepana (species?), but are "much larger;" they are found singly on the upper side of leaves and are said in order to pupate to roll a part of the leaf together so as to form a tube closed at both ends by a white web. (Strand.)

The remarks about the larva rolling up a part of the leaf to form its cocoon are quite correct, and *Oreta calida* Butler has the same habit.

Pryer [2] states that the larva of *Oreta calceolaria* feeds on the wild grape.

Leech [3] observes of *O. pulchripes* that—

> There is much variation in tone of colour and definition of markings in this species. Some examples are dark reddish brown with a lilacine

[1] Rom. Mém. Lép. 6 (1892) 333.
[2] Trans. Asiat. Soc. Jap. 12 (1884) 58, No. 248.
[3] Proc. Zool. Soc. London (1888) 650.

suffusion, others are pale yellowish brown, tinged with rosy lilacine, especially along the costa of primaries. Then as regards the linear markings, these in the darker-coloured examples are not very distinct; but in pale specimens they are conspicuous. Often the area enclosed by the transverse lines is darker than rest of wing, thus giving a band-like character. The costal black spots as well as that at external angle are not always clearly defined and are often quite absent, whilst two examples have a colon-like spot at external angle. When the outer grey line of primaries is well defined, it can be traced from the outer costal spot, from whence it runs for a short distance towards external margin, then turning sharply inwards continues its course to near the middle of the wing, when it curves gently and terminates on the inner margin; the costal extremity of yellow border of this line is sometimes placed in a pale apical patch.

Of *O. calceolaria* the same author remarks:

In this species the reddish-brown colour of wing-markings is a variable quantity. Sometimes the entire areas representing the basal two thirds of primaries and basal third of secondaries are reddish brown. The sulphur colour on the outer portion of all the wings is often sprinkled with dark grey dots, and sometimes a larger spot or two occurs at external edge of primaries. All the characters, both structural and ornamental, of this species are identical with those found in *O. pulchripes*, and the only difference I can see between the two insects is one of colour.

Calceolaria is a yellow form of *O. pulchripes*, and is much commoner than the type.[4]

Graeser regards the commoner yellow form *calceolaria* as the ancestral type, *Stammart.*

Local distribution.—Honshu, Musashi Province, Tokyo and Yokohama, May, June, and July (*Wileman*): Yamato Province, Ominesan and Yoshino, June, July, and September (*Wileman*): Shimotsuke Province, Nikko, August (*Wileman*): Shinano Province, Oiwake (*Pryer*): Hida Province, Norimasa, July and August (*Nagano*). Shikoku, Iyo Province, Senzoku, June (*Wileman*). Hokkaido, Oshima Province, Hakodate, July (*Wileman*), August (*Leech*). The types of *Oreta pulchripes* and *O. calceolaria* are both from Yokohama (*Jonas*). Matsumura, who separates *O. pulchripes* and *O. calceolaria*, records them from Honshu only.

Time of appearance.—Larva, June; imago, May to September. Probably there are two broods annually.

General distribution.—Eastern Siberia (Amurland, Ussuri); West China; Japan; Loochoo Islands (Ryukyu) (*Strand*). Manchuria (*Matsumura*).

[4] Leech, Trans. Ent. Soc. London (1898) 372.

Oreta calida Butler.

Plate 1, fig. 4, larva; fig. 5, head; fig. 6, food plant.

Japanese names, *futatsume-kagiba, kurosuji-kagiba, gamazumi no imomushi-chō.*

Oreta calida Butler, Ann. & Mag. Nat. Hist. IV 20 (1877) 477; Ill. Typ. Lep. Het. 2 (1878) 14, pl. 25, fig. 6; Leech, Proc. Zool. Soc. London (1888) 649, No. 331; Trans. Ent. Soc. London (1898) 372, No. 335; Matsumura, Cat. Insect. Jap. 1 (1905) 48, No. 396; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] suppl. 1, 131, No. 229, pl. 13, fig. 3 ♂; Nagano, Nawa's Insect World [Konchū Sekai (Jap.)] 13 (1909) 222, pl. 11, figs. 1–10, ova, larva, pupa, imago; Nihon Rinshirui Hanron (Jap.) (1905) 166, pl. 3, fig. 2; Bull. Nawa Ent. Lab. 2 (1917) 43, pl. 3, fig. 13 ♀, pl. 10, figs. 7–13 [Nawa Konchū Kenkyūjō Hōkoku (Jap.)] 135; Sasaki, Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 3, 61, pl. 192, larva, imago; Strand, Seitz's Macrolep. Faun. Pal. 2 (1911) 205, pl. 22, fig. *i*, sex?

The larva figured (Plate 1, fig. 4) was taken in July, 1902 (figured, July 3), at Hakodate, Oshima Province, Hokkaido (Yezo), on *awaha* (= ? *awaki, Lindera glauca* Blume). Awaha is the Japanese name given by my Japanese collector for the food plant, but I am unable to find such a name in J. Matsumura's Shokubutsu Mei-i. A male imago emerged from this larva on July 24, 1902, and two females from similar larvæ on July 11 and 26, 1902. I also bred two imagoes from larvæ taken in Tokyo, Honshu, which were found on *keyaki* (*Zelkowa acuminata* Planchon var. *keaki* Siebold). These two larvæ pupated on May 16 and 25; and the imagoes probably emerged in June, but no record was kept.

The larva, as will be observed from the figure (Plate 1, fig. 4), differs considerably in color from that of *Oreta calceolaria* Butler (Plate 1, fig. 1). I describe the larva from my artist's original figure as follows:

Larva.—Length from head to anal tail, about 35 millimeters. Head bifurcated, dark brown, marked with a pale ochraceous inverted V-shaped mark and pale ochraceous at the sides. The color dorsally is a very dark brown, which is interrupted dorsally at segment 4 by a green patch extending laterad; mediolaterally green, interrupted at segments 4 and 5 by a broad dark brown patch proceeding from the dorsum laterad, and directed obliquely upward and forward; from this dark brown patch the mediolateral green color takes a half-moon shape from segment 5 to segment 10 and then proceeds attenuated, being almost interrupted by the dorsal dark brown color, to the anal segment; a grayish brown subspiracular stripe faint on the an-

terior segments, broad on segments 6 to 10, and attenuated from segment 11 to anus; a long anal tail, about 7 millimeters in length, slightly hairy; legs and prolegs grayish (single? or paired?); short tubercles on segments 2, 3, and 4 and an acuminate, thorn-shaped (single? or paired?) process, with the point projecting anad, on segment 5.

Pupa.—Pupa inclosed in a cocoon spun in a rolled-up leaf in the same manner as *Oreta pulchripes* Butler.

Imago.—My females of this species differ a good deal in color from the male, being a dark umber brown, mottled with black instead of a "laky brown mottled with black" as described by Butler. Leech [5] remarks that "the brown coloration varies in tint from greyish to laky brown; both sexes have a discal series of black dots on primaries."

Nagano [6] comments on *Oreta calida* Butler, as follows:

Egg.—Elliptical, densely covered with microscopic granules, yellow at first, becomes brown afterwards. Length, 0.6 mm.

Larva.—Body colour variable. Generally head dark brown, tinged with ochreous, scattered over with yellowish gray granules, horn-like process on epecranium. Body green; dorsal area of pro- and mesothorax dark brown; prothorax with a pair of ochreous processes on the dorsum; metathorax with a dark brown fleshy horn, scattering minute granules; dorsal area of 1st–7th abdominal segments dark brown; incomplete dark-brown subdorsal line from 3rd thoracic to 6th abdominal; lateral side of 1st abdominal with oblique dark-brown dash; lateral side of 2nd–6th abdominals with blackish brown Λ-shaped line; tail-like process dark brown with two pale yellow rings, densely covered with minute granules; basal line much wrinkled, whitish or yellowish anteriorly and posteriorly, pale pinkish in 2nd–6th abdominal segments, scattering white granules; ventral surface grayish white. Length about 42 mm, from the head to the tail's tip.

Pupa.—Elliptical, brown; abdominal area tinged with ochreous more or less; a pair of short spines on the head. Head and thorax covered with yellow or white powder. Length about 28 mm.

Remarks.—Generation may be twice or thrice per annum. Larva feeds on Viburnum dilatatum, V. sieboldi, V. odoratissimum in April and when mature it spins a cocoon, rolling up a leaf of the food-plant, to pupate therein after 2 or 3 days. Pupal stage lasts about two weeks and moth appears from the middle of May to the beginning of June. The second sex appear from the end of July to the middle of August. Sometimes moths appear from the end of September to the beginning of October, these may be a third generation. How it passes the winter is unknown as yet, but once the moth was taken in December; perhaps it hibernates.

Local distribution. Hokkaidō; Honshū (Tokyo, Yokohama, Oiwake, Gifu, Minoo).

[5] Proc. Zool. Soc. London (1888) 650.
[6] Bull. Nawa Ent. Lab. 2 (1917) 43.

Local distribution.—Honshu, Musashi Province, Yokohama (*Jonas and Pryer*); Tokyo, June? (*Wileman*): Shinano Province, Oiwake (*Pryer*). Hokkaido, Oshima Province, Hakodate and Junsai Numa, July and August (*Wileman*). Matsumura records the species from Hokkaido and Honshu. The male and female types are from Yokohama (*Jonas*) and Hakodate (*Whitely*).

Time of appearance.—Larva, May and July; imago, June?, July, August.

General distribution.—Japan (*Strand*).

Genus KONJIKIA Nagano[7]

Drepana SCHRANK, Fauna Boica ii (1802) 2, 155.

Konjikia NAGANO, Bull. Nawa Ent. Lab. 2 (1917) 39; [Nawa Konchū Kenkyūjō Hōkoku (Jap.) 124].

Konjikia crocea Leech.

Japanese names, *ukon-kagiba, kiiro-kagiba.*

Drepana crocea LEECH, Proc. Zool. Soc. London (1888) 649, No. 329, pl. 32, fig. 7; Trans. Ent. Soc. London (1898) 365, No. 310; KIRBY, Cat. Lep. Het. (1892) 734; MATSUMURA, Cat. Insect. Jap. 1 (1905) 49, No. 401; Nihon Rinshirui Hanron (Jap.) (1905) 167, pl. 3, fig. 11; STRAND, Seitz's Macrolep. Faun. Pal. 2 (1911) 201, pl. 23, fig. *b*, sex?

Konjikia crocea NAGANO, Bull. Nawa Ent. Lab. 2 (1917) 39, pl. 3, ♂, fig. 19; pl. 9, figs. 10–14; Nawa Konchū Kenkyūjō Hōkoku (Jap.) 124, fig. 7 (pupa, after Yano).

Owing to pressure of work my artist was unfortunately unable to figure the larva of this species before it pupated. I beat several larvæ from *akagashi* (*Quercus acuta* Thunberg), at Kobe, Settsu Province, in May, 1901, and bred a female imago of *Drepana crocea* from one of these in June, 1901. The larva is a most curious one, having short, vertical, paired, dorsal processes on several of the segments which are capable of being appressed close to the body or erected vertically at the will of the larva. When the larva falls into the beating tray, it depresses these processes and, feigning death, simulates a dead leaf. After a time it revives and elevates its processes. I am unable to give any description of the larva further than that it was brown, as I took no notes. I kept the empty pupa case of the

[7] This generic name is derived from *konjiki*, meaning in Japanese "golden color," the type species being golden yellow. Type, *Drepana crocea* Leech.

female imago bred in June, and the following is a description of it:

Pupa.—Length, 20 millimeters. Color shining whitish brown; abdominal rings, thorax, and wing cases much darker; anal cremaster long and pointed, about 2.5 millimeters long. Two light-colored processes about 2 millimeters long protrude from the head and each of these is tipped with a trifid knob, which somewhat resembles a crab's claw. So far as I am aware the larva is unlike that of any other *Drepana* larva in Japan.

Nagano comments on *Konjikia crocea* as follows:

> Pupa.—One pair of curious horns, dilating at the top, on head (Fig. 7 in Japanese text).
>
> Life history unkown, but it is clear that there are two generations every year, as the moths appear in May–June and again in October–November at Gifu. It is supposed that the larva feeds on Quercus serrata [Thunberg]. According to Yano's figure the pupa is spindle shaped, with dull front; pale brown tinged with dark green; two curious horn-like processes, having a short branch and dilating top, on the head; a series of pinkish white rings on dorsum of abdomen.
>
> Local distribution. Honshu (Nikko, Kōnosu, Tokyo, Gifu).

Local distribution.—A series of seven males and four females in the Wileman collection from the following localities: Honshu, Musashi Province, Tokyo, June, October: Yamato Province, Yoshino, July, September, October: Settsu Province, Kobe, June, bred.

Time of appearance.—Larva, May; imago, June, July, September, October.

General distribution.—Japan; western China. (*Leech.*)

ZYGÆNIDÆ

ZYGÆNINÆ

Genus **ZYGÆNA** Fabricius

Zygæna FABRICIUS, Syst. Ent. (1775) 550.

Zygæna niphona Butler.

Plate 1, fig. 7, larva, dorsal aspect; fig. 8, larva, lateral aspect; fig. 9, food plant.

Japanese names, *benimon-madara, hi-kanokoga.*

Zygæna niphona BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 393; Ill. Typ. Lep. Het. 2 (1878) 4, pl. 21, fig. 9; LEECH, Proc. Zool. Soc. London (1888) 597, No. 73; Trans. Ent. Soc. London (1898)

325, No. 184; KIRBY, Cat. Lep. Het. 1 (1892) 73; STAUDINGER, Rom. Mém. Lép. 6 (1892) 251; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 383, No. 4347; MATSUMURA, Cat. Insect. Jap. 1 (1905) 181, No. 1513; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1911) suppl. 3, 71, No. 618, pl. 35, fig. 23, ♀; SEITZ, Macrolep. Faun. Pal. 2 (1909) 25, pl. 6, fig. e, ♂ ♀.

Zygæna christophi STAUDINGER, Rom. Mém. Lép. 3 (1887) 173, pl. 8, fig. 9.

The larva figured (Plate 1, figs. 7 and 8) was taken in June, 1902 (figured, June 28), at Hakodate, Oshima Province, Hokkaido, on *kitsune-mame*, also known as *tankiri-mame* and *kinchaku-mame* (*Rhynchosia volubilis* Loureiro). It pupated on July 25, 1902, and a female imago emerged on August 20, 1920. Four other imagoes were bred from similar larvæ on August 11 and 16, 1902. I describe the larva from my artist's original figure as follows:

Larva.—Length, about 21 millimeters. Head black, tipped with white at the mandibles. Color green. A mediodorsal, rather broad white stripe; a mediolateral, narrower white stripe on each side, bordered above by a row of eleven minute black dots situated just above the stripe on the segmental sutures of each segment, commencing at segment 3 and ending at segment 12; eleven small yellow spots are also placed beneath each black dot and are situated on the stripe; there is an additional one on segment 2; spiracles similar in shape, color, and size to the upper row of small black dots; legs, prolegs, and claspers whitish, tipped with black at the base.

The larva of *Z. ephialtes* Linnæus (= *falcatæ* Boisduval), a description of which is given by Seitz,[8] seems somewhat to resemble that of *Z. niphona* Butler. *Zygæna peucedani* Esp. (= *hippocrepidis* Herrich-Schäffer; *aeacus* Hübner), with six spots, is given by Seitz as a "red form of ephialtes Linn., similar in appearance to red-belted *filipendulae* resp. *trifolii* ab. *orobi*."

Staudinger[9] remarks that—

* * * there cannot be the slightest doubt that *Z. peucedani* which Bremer[10] brought from Amurland (taken by Radde in the Bureja Mountains, by Maack at Sangatscha, by Wulffius at Possiet Bay and Port Bruce), belongs to this [*Zygæna niphona* Butler].

[8] Macrolep. Faun. Pal. 2 (1909) 24.
[9] Rom. Mém. Lép. 6 (1892) 251.
[10] Lep. Ost. Sib. (1864) 36.

Zygæna christophi Stgr., which, according to Staudinger, is identical with *Z. niphona* from Japan, is found in eastern Siberia (Amurland and Ussuri).

Seitz [11] comments on *Z. niphona* Butler as follows:

> The only Burnet from East Asia. * * * Though the species varies considerably, some specimens being 6-spotted and resembling therefore *Z. peucedani*, there are no local races.

The description of the larva of *Z. ephialtes* Linn. is as follows:

> Larva yellow or green, reddish yellow at the sides, with pale belts; a dorsal stripe and subdorsal rows of spots black; above the legs rows of black dots; on the whole similar to the larva of *filipendulae;* in May adult on Vetch, Trefoil, Thyme, Eryngium, Plantago, etc.; the black pupa in a white-yellow silky cocoon.

Pupa.—The pupa of *Z. niphona* is inclosed in a yellow, leathery, glazed, fusiform cocoon.

Imago.—Leech [12] remarks:

> There may be either five or six spots on the upper surface of the primaries; but the sixth spot is always indicated on the under surface, sometimes only faintly. Butler's figure represents a specimen with the spots confluent, and I have two similar specimens in my series; but such variation does not appear to be of frequent occurrence.

Butler's type of *Zygæna niphona* is said to have come from Yokohama, Honshu. I doubt the correctness of this locality, as I have never known *Z. niphona* to be taken near Yokohama on the plains and think it very probable that the type was taken by Jonas somewhere in the mountains of Shinano in the region of Mount Asama.

Local distribution.—Honshu, Shinano Province, Karuizawa, August (*Wileman*); Oiwake (*Pryer*): Yamato Province, Dorokawa (*Wileman*). Hokkaido, Oshima Province, Hakodate, August (*Wileman, Leech*). Matsumura records the species from Honshu only. It seems to frequent the mountains in Honshu at elevations of from 610 to 914 meters (2,000 to 3,000 feet), while in Hokkaido, in a more-northern latitude, it is found on the plains.

Time of appearance.—Larva, June; pupa, July; imago, August.

General distribution.—Eastern Siberia (Amurland, Ussuri); Japan. (*Leech.*)

[11] Macrolep. Faun. Pal. 2 (1909) 25.
[12] Trans. Ent. Soc. London (1898) 325, No. 184.

LIMACODIDÆ

Genus CNIDOCAMPA Dyar

Cnidocampa DYAR, Proc. U. S. Nat. Mus. 28 (1905) 952.

Cnidocampa flavescens Walker.

Plate 1, fig. 10, larva; fig. 11, cocoon; fig. 12, food plant.

Japanese names, *iraga, iramushiga.*

Monema flavescens WALKER, Cat. Lep. Het. 5 (1855) 1112; BUTLER, Ill. Typ. Lep. Het. 2 (1878) 14, pl. 25, fig. 5; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 41; FIXSEN, Rom. Mém. Lép. 3 (1887) 342; LEECH, Proc. Zool. Soc. London (1888) 610, No. 148; Trans. Ent. Soc. London (1899) 103, No. 366; (*Miresa*) GRAESER, Berlin Ent. Zeit. 32 (1888) 121; STAUDINGER, Rom. Mém. Lép. 6 (1892) 300; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 392, No. 4433; (*Monema*) DE JOANNIS, Bull. Ent. Soc. France (1896) 147; GRIBODO, Bull. Ent. Soc. France (1896) 179; DU BUYSSON, Ann. Ent. Soc. France 67 (1898) 80; Bull. Ent. Soc. France (1901) 29; MATSUMURA, Nihon Gaichuhen (Jap.) (1899) 77, pl. 33, ova, cocoon, imago ♀; Thousand Insects of Japan [Nihon Senchū Zukai (Jap.)] (1911) suppl. 3, 45, No. 573, pl. 33, fig. 19, imago ♀; Cat. Insect. Jap. 1 (1905) 184, No. 1533; KRAEPELIN, Mitth. a. d. Naturhist. Mus. Hamburg 18 (1901) 196; (*Monema*) NAGANO, Insect World [Konchū Sekai (Jap.)] 6 (1902) 53, cocoon, imago ♀; SASAKI, Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910), pt. 3, 68, pl. 195, larva, pupa, cocoon, imago; Insects Injurious to Fruit Trees [Kajū Gaichūhen (Jap.)] ed. 5 (1911) 203, pl. 65, larva, cocoon, imago; (*Miresa*) SEITZ, Macrolep. Faun. Pal. 2 (1912) 344, 449, pl. 50 fig. C.

Monema flavescens forma *nigricans* DE JOANNIS, Bull. Ent. Soc. France (1901) 251.

Cnidocampa flavescens DYAR, Proc. U. S. Nat. Mus. 28 (1905) 952, fig. 19, larva, fig. 20, cocoons; FERNALD, Bull. Hatch Exp. Station, Mass. Agr. Coll. 114 (1907); FERNALD and SUMMERS, Ent. News 18 (1907) 321; DICKERSON, Ent. News 18 (1907) 373; JOUTEL, Journ. N. Y. Ent. Soc. 15 (1907) 175; DYAR, Proc. Ent. Soc. Washington 11 (1909) 162, pl. 14, figs. 1–4.

The larva figured (Plate 1, fig. 10) was taken in September, 1900 (figured, September 27), at Yoshino, Yamato Province, Honshu, on dwarf oak, Japanese name *kunugi* (*Quercus serrata* Thunberg). It spun on October 5, 1900, and an imago (sex?) emerged on June 12, 1901. Two male and four female imagoes also emerged on June 12 and 13, 1901, from similar larvæ reared by me. I have taken the larvæ on Spanish chestnut (*Castanea vulgaris* Lamarck var. *japonica* de Candolle) and on dwarf oak, Japanese name *konara* (*Quercus glandulifera* Blume). It seems to be polyphagous. The larva urticates severely, and a disagreeable shock is experienced if the hand happens to come in contact with it, when searching for larvæ among the leaves of a tree.

Dyar [13] mentions the "special structural characters, affinities, habits, etc." of the larva accompanied by a full description of its eight larval stages. These are illustrated by excellent figures of the first and fifth stages of the mature larva, and of the caltrop spines of the mature larva greatly enlarged.

As the larva has already been described by many entomologists I refrain from doing so but give the short description contained in Seitz's Macrolepidoptera [14] as follows, referring those who wish for more-complete details to Dyar's life history of the species:

The larva is green with broad violet-brown dorsal stripe, and armed with setiferous warts; it feeds on deciduous trees, particularly Elm, and rests on the underside of the leaves. Korb figures the larva, the setiferous tubercles being distinct in the figure, long on the anterior and posterior segments, and much shorter on the central ones. The dorsal stripe is irregular, being widened on the thoracical segments in the shape of a shield. The caterpillar spins in the autumn a very pretty whitish cocoon, with markings like a bird's egg consisting of minutely divided, dark longitudinal splashes, the cocoon being thus rendered similar to that of the Japanese *Setora nitens*. In this cocoon the larva remains until the next June without changing into a pupa. The species is exceedingly numerous, the larvae occurring in abundance on all kinds of deciduous trees, but full-fed larvae are often parasitised. The cocoons have lately been brought to Europe in quantities, but only a few give results, many dying because the unchanged larva appears to suffer much more from transport than the pupa.

Sasaki [15] gives figures and descriptions of the larva, pupa, cocoon, and imago and a short life history of the species. He says:

The larva appears about the commencement of September and feeds upon *kaki* [persimmon, *Diospyros kaki* Linnæus]; *hyakujikkō* [or *sarusuberi* (*Lagerstrœmia indica* Linnæus)]; *sakura* [cherry, *Prunus* sp.]; *nashi* [pear, *Pirus* sp.]. It is full grown from the end of September to November. The cocoon is popularly known as *suzume no tago* [16] [sparrow's bucket] and also as *suzume no ogoke* [sparrow's box].[17]

[13] Proc. U. S. Nat. Mus. 28 (1905) 952, figs. 19 and 20; Proc. Ent. Soc. Wash. 11 (1909) 162, pl. 14, figs. 1–4.

[14] Macrolep. Faun. Pal. 2 (1912) 344.

[15] Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 3, 68, pl. 195, larva, pupa, cocoon, imago; Insects Injurious to Fruit Trees [Kajū Gaichūhen (Jap.)] (1911) 203, pl. 65.

[16] *Tago* is a bucket carried on the shoulder by means of a pole. Another name, not given by Nawa, is *suzume no tamago*, or sparrow's egg.—A. E. W.

[17] *Ogoke*, a round wooden box anciently used in twisting and joining threads of hemp together preparatory to twisting into a cord.—A. E. W.

It hibernates in the larval stage inside its cocoon and changes to a pupa in the following spring. The imago emerges from the cocoon in the following August.

Matsumura [18] gives figures and descriptions of the ova, cocoon, and imago, and a life history of the species. He says that—

* * * it is single brooded and hibernates in the larval stage. Before it hibernates it spins its egg-shaped cocoon and passes the winter inside it, changing into a pupa in the following May or June. The imago emerges in about three weeks after the pupa is formed. The female lays some two hundred eggs which take about ten days to hatch. The larvæ are full grown about the end of September when they spin their cocoons, and hibernate as previously stated. The larva urticates severely and produces a rash.

Other food plants given by Matsumura are *kihada* [Latin name?; *kuwa* [mulberry, *Morus* sp.]; *ringo* [apple, *Pirus* sp.]; *ume* [plum, *Prunus* sp.]; *kankitsu* [Latin name?]; *sumomo* [*Prunus communis* Hudson]; *biwa* [loquat, *Eriobotrya japonica* Lindley].

Pryer states as follows:

Feeds on the celtis [*enoki* (*Celtis sinensis* Persoon)] and elm [Japanese name, *buna no ki* (*Fagus* sp.)]. Forms an oval, very hard and smooth cocoon, mottled with white and brown, very much resembling a bird's egg; the larva spins up in the autumn but does not change to a pupa until spring.

Nawa [19] gives figures of the cocoons and imago and a popular account of its transformations. He says that—

* * * the larva, which is generally known as iramushi [stinging grub], is also locally known in various places as *okoze, shibamushi, hankyōji,* and is employed as a specific for certain diseases. It has several Sinico-Japanese names and is referred to as a drug in a book named Honsōshō [The Book of Plants, Author?]. Names similar to the Japanese names for the larva also exist in China.

In addition to *kaki* [persimmon, *Diospyros kaki* Linnæus], he gives *katsume* [*Zizyphus vulgaris* Lamarck var. *inermis* Bunge] as a food plant.

The cocoon is correctly known as suzume no tsubo [sparrow's jar]; provincially, or locally, it goes by the names of suzume no makura [sparrow's pillow], suzume no tago [sparrow's bucket], suzume no tsubo [sparrow's jar].

It turns into a pupa inside its cocoon about June or July and is single brooded.

[18] Japanese Injurious Insects [Nihon Gaichūhen (Jap.)] (1899) 77, pl. 33; Thousand Insects of Japan [Zoku Nihon Senchu Zukai (Jap.)] (1911) suppl. 3, 45.

[19] Nawa's Insect World (Konchū Sekai) 6 (1902) 53.

All the foregoing names seem to have been given to the cocoon (Plate 1, fig. 11) on account of its resemblance to a sparrow's egg, which Pryer and other authors also notice.

Dyar describes the cocoon as follows:

Cocoon.—Elliptical, rounded, smooth, hard, and dense, firmly attached upon one side to the bark of the tree. White and gray-brown, marked in a peculiar pattern. Usually there are several broad brown streaks radiating from each pole of the cocoon, but the colors may also be variously intermixed, or even nearly uniform gray. The moth emerges by a circular lid, of which there is no sign from the interior.

He enumerates the food plants as follows:

Food-plants.—Various deciduous trees and shrubs. Gribodo records pear and rose. Kraepelin found the cocoon on maple. Fernald found the Norway maple the preferred food, but also pear, apple, cherry, and less commonly willow, birch, oak, elm, blackberry, beech, poplar, mountain-ash, buckthorn, and rose. My larvae fed readily on wild cherry, though the liberated moths did not oviposit on this tree, but on maple, rose, and cultivated plum.

Local distribution.—Honshu, Musashi Province, Tokyo, June: Yamato Province, Yoshino, July: Settsu Province, Kobe, June (*Wileman*). Hokkaido, Oshima Province, Hakodate, June, July (*Leech*). Matsumura records the species from Hokkaido, Honshu, Shikoku, and Kyushu. The type is from northern China.

Time of appearance.—Ovum, June and July?; larva, August to November; cocoon, October to May or June of following year. The larva hibernates inside the cocoon and changes to a pupa inside it between April? and June or July of the following year.

Imago.—June to August of following year. Single brooded.

General distribution.—Korea; central and northern China; eastern Siberia (Ussuri, Amurland); Japan. (*Leech.*)

ÆGERIADÆ

Genus **PARANTHRENE** Hübner

Paranthrene HÜBNER, Verzeichniss (1822) 128; BARTEL, Seitz's Macrolep. Faun. Pal. 2 (1912) 376, 379.

Sciapteron (recte *Sciopterum*) STAUDINGER, Diss. de Sesiis agri Berol. 43 (1854).

Paranthrene regale Butler.

Plate 2, fig. 1, larva, lateral aspect; fig. 2, larva, dorsal aspect; fig. 3, food plant.

Japanese name, *budō-sukashiba.*

Sciapteron regale BUTLER, Ill. Typ. Lep. Het. 2 (1878) 60, pl. 40, fig. 3; LEECH, Proc. Zool. Soc. London (1888) 591, No. 47; PRYER,

Trans. Asiat. Soc. Japan 12 (1884) 39; MATSUMURA, Nihon Gaichūhen (Jap.) (1899) 263, pl. 114, imago; Cat. Insect. Jap. 1 (1905) 187, No. 1559; Thousand Insects of Japan (Zoku Nihon Senchū Zukai) (Jap.) (1911), suppl. 3, 88, 745, pl. 36, fig. 21, ♀; SASAKI, Kwajū Gaichūhen (Jap.) (1911) ed. 5 (1911) 136, pl. 36, larva, imago ♀.

Paranthrene regale Butler, BARTEL, Seitz's Macrolep. Fauna Pal. 2 (1912) 380, pl. 51, fig. *b*, sex?

The larva figured (Plate 2, fig. 1) was taken in December, 1900 (figured, December 5), at Kobe, Settsu Province, Honshu. It was feeding, as represented in the figure, inside the stem of the wild grapevine, Japanese name, *yama-budō* (*Vitis coignetiæ* Pull.). I did not succeed in rearing an imago from this larva, which died, and hitherto have been unable to identify it with absolute certainty as being that of *Paranthrene* (*Sciapteron*) *regale* Butler, although, owing to the fact that Pryer states that *yama-budō* is the food plant of *P. regale,* I have always suspected that my figure represented the larva of that species. I have lately perused the works of Matsumura and Sasaki, and it will be noted from the following quotations taken from them that they also give *yama-budō* as the food plant of *P. regale* and comment on the "long oval swellings, or nodules," which it causes in the stem, as shown in my figure. My larva also agrees with the figure and description given by Sasaki, who, however, does not mention the dark mediodorsal line distinctly shown in my figure (Plate 2, fig. 2). This evidence I think is sufficiently corroborative, and I feel justified in referring my larva to *P. regale* Butler. I learned from my Japanese collector, to whom I showed my artist's original figure, that the larvæ of *P. regale* are much prized by the Japanese proletariat as a medicine and that nodules of the wild grapevine, each containing one larva, are sold at apothecary shops for about 3 sen each (1.5 cents United States currency). The larva is regarded as an efficacious cure for intestinal pains in adults and for worms in children and is frequently baked and eaten by patients suffering from these maladies. The superstition which is prevalent among the Japanese proletariat concerning the efficacy of certain larvæ to cure diseases is also alluded to under the headings of *Brahmæa japonica*[20] and *Phassus excrescens*.[21] It is akin to a similar superstition which causes some Japanese to eat raw snakes for the purpose of acquiring strength, a custom that I

[20] Philip. Journ. Sci. 19 (1921) 228. [21] Postea, pp. 93 and 94.

have actually witnessed in my wanderings through Japan. On one occasion, while traveling through a wild and mountainous district in Yamato Province, a peasant, who was employed as porter to carry a load of my baggage, caught and killed a *mamushi* (Japanese viper) which he skinned and partially devoured on the spot, giving as his reason for making this very unsavory and repulsive meal that the mamushi would give him strength.

Pryer [22] comments on *Sciapteron regale* Butler as follows:

> Yokohama; this feeds on the wild grapevine, causing large oval swellings 1 to 3 inches long in the stem. It is the only one of this family I have as yet bred. It is moderately common, and a few hours search will be always rewarded by a number of the fol. [sic], which, if nearly full-fed, can easily be reared.

Matsumura [23] gives a figure of the imago of *Sciapteron regale* Butler and says:

> The larva resembles that of *Aegeria hector* Butler but is larger.[24] When full-grown it measures about one sun [1 Japanese sun, or inch, equals 33 millimeters]. * * * its life history has, so far, not been thoroughly investigated. When the wild grape vine is attacked by the larva an egg-shaped nodule of from 7 bu [23.1 millimeters] to 2 sun [66 millimeters] in length is produced in the locality affected which causes much injury by cutting off the ascension of the sap.

Sasaki [25] gives figures and descriptions of the larva and female imago of *Sciapteron regale* Butler. He says that—

> * * * the larva appears in September and feeds internally on the tissue of the stem of the *yama-budō* [wild grape, *Vitis coignetiæ* Pull.] and the kama-ebi [Latin name?]. It excavates a long, internal channel and is extremely injurious to the stems. The stem in which the larva lives is much swollen and a hole is opened in the side from which the larval excrement issues. It is therefore easy to ascertain the presence of a larva by the swelling and the exudation of excrement. The larva hibernates in the stem. In May of the following year it stops up with silken threads both ends of the long channel which it has excavated, and turns into a pupa inside it. The imagoes begin to emerge at the commencement of June. When the pupa is about to change into a moth it projects the anterior half of its body from the small hole opened in the side of the stalk which it inhabits and the imago then emerges. The full-grown

[22] Trans. Asiat. Soc. Japan 12 (1884) 39.

[23] Nihon Gaichūhen (Jap.) (1899) 263, pl. 114, imago.

[24] *Aegeria hector* Butler; Matsumura, Zoku Nihon Gaichūhen (Jap.) (1899), 260, pl. 113, larva, pupa, imago; does not feed on *yama-budō* (wild grapevine) but on *ōtō* (*sakurambō*) (Latin name?); *ume*, plum (*Prunus* sp.); *sumomo* (*Prunus communis* Hudson).

[25] Kwajū Gaichūhen (Jap.) ed. 5 (1911) 136, pl. 36.

larva [26] is over 6 bu [18.18 millimeters] in length, of a light yellow color; the head is reddish brown; the cervical plate of segment 1 is yellowish brown and the body emits a few coarse hairs; 3 pairs of legs; 5 pairs of abdominal legs.

Pupa. More than 7 bu [21.1 millimeters] in length, dark brown; the abdominal segments provided with small spines.

In later notes on the larva of the *budō-sukashiba*, Sasaki [27] says:

* * * the larva of the *budō-sukashiba*, *Strapteron* [!] *regale* Butl., inhabits the stems of the budō [grapevine] and the no-budō [wild grapevine] and injures the tissues, for which reason this injurious insect is a constant source of trouble to the grape-cultivator. When a larva infests a stem the one in which it lives swells considerably and can therefore be easily distinguished from a sound stem. If a vine is attacked by this larva the strength of the upper part of the stem affected is gradually impaired and it withers away because the circulation of the sap has been stopped at the place where it has been injured.

The larva (*figure* a) hibernates in the stem and changes into a pupa in March or April and the imago emerges at the middle, or end, of May. It is a favourite food of birds and those who keep fowls send out coolies into the fields in winter to collect wild grapevines which contain the larvæ. As previously stated the stems of the affected vines are always swollen and it is therefore easy to recognize those which contain larvæ. These are cut off at both ends but only the parts which are swollen are kept and cut open later on, after which they are given to fowls and small birds by the bird fanciers who purchase them for that purpose. * * * These bird fanciers usually sell the larvæ at one to two sen [about 0.5 to 1 cent United States currency] apiece on which they make a good profit. The injurious larva of the grapevine must, therefore, be called a golden worm as far as the bird fanciers are concerned.

The family Ægeriadæ is now placed in the Microlepidoptera, in the British Museum collection.

Local distribution.—Honshu, Nagato Province, Shimonoseki, July (*Leech*): Musashi Province, Yokohama (*Pryer*): Settsu Province, Kobe (*Wileman*). Kyushu, Satsuma Province, May (*Leech*): Hizen Province, Nagasaki, May, June (*Leech*). Matsumura records this species from Honshu and Kyushu and states that it is not rare in the neighborhood of Kyoto, Honshu. The type is from Yokohama (*Jonas*).

Time of appearance.—Larva, September to May; pupa, May; imago, May to July.

General distribution.—Japan; China (Kiukiang). (*Pratt.*)

[26] My larva measures 33 millimeters.—A. E. W.

[27] Nawa's Insect World 20 (1916) 3, figs. a, b [Konchū Sekai (Jap.)].

HEPIALIDÆ

Genus **PHASSUS** Walker

Phassus WALKER, Cat. Lep. 7 (1855) 1566.

Phassus excrescens Butler.

Plate 2, fig. 4, larva; larva of forma *æmulus* Butler? 5, roof over hole of female larva.

Japanese names, *kōmoriga, gusagi no shinkuiga, kiri no teppō-mushi chō.*

Hepialus excrescens BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 482; Ill. Typ. Lep. Het. 2 (1878) 20, pl. 27, fig. 7, ♂; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 40, No. 55; LEECH, Proc. Zool. Soc. London (1888) 645, No. 313; Trans. Ent. Soc. London (1898) 356, No. 282; KIRBY, Cat. Lep. Het. 1 (1892) 889; STAUDINGER, Rom. Mém. Lép. 6 (1892) 289; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 410, No. 4723; MATSUMURA, Cat. Insect. Jap. 1 (1905) 189, No. 1573; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1911), suppl. 3, 54, No. 590, pl. 34, fig. 17, ♂; SEITZ, Macrolep. Faun. Pal. 2 (1912) 438.

Hepialus æmulus BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 482; Ill. Typ. Lep. Het. 2 (1878) 20, pl. 27, fig. 8, ♂; Y. NAWA, Insect World [Konchū Sekai (Jap.)] 5 (1901) 410, pl. 11, larva, pupa, imago ♂ ♀ (*Hepialis*); SASAKI, Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 3, 3, pl. 163.

The larva figured (Plate 2, fig. 4) was taken in November, 1900 (figured, November 30), on poplar, *hako-yanagi* (*Populus tremula* Linnæus var. *villosa* Wesm.). I did not succeed in rearing the imago, as the larva died. My Japanese collector identified the larva as that of *Phassus signifer* Walker, which is taken in Japan. I showed a set specimen of *P. signifer* to him, and he recognized it as the imago of my larva and gave me the following information:

The ova are deposited on the branches of the *kusagi* [*Clerodendron tricotomum* Thunberg] and the *aburagi* [*Acanthopanax sciadophylloides* Franchet and Savatier]. When the ova hatch the young larvæ feed on the leaves for about a month, then begin to burrow into the trunk of the tree. The larva pupates inside the groove it has eaten out of this trunk, and when it has pupated the pupa gradually works its way to the entrance of the hole from which it partially protrudes. If the tree is sharply knocked the pupa recedes into the groove, emerging again later on. In order to procure specimens of the imago in good condition it is necessary to capture them when freshly emerged on the tree trunks as they soon become worn owing to their strong and rapid flight. The imago emerges very early in the morning and is difficult to breed in captivity. The pupa of the male, which measures about 1 inch, is much smaller than that of the female,

which measures about 2 inches. In a good many instances the female larva builds a roof over its hole [Plate 2, fig. 5] composed of excrement thickly matted with silken threads for the purpose of protecting the entrance from rain and ants. The hole made by the female larva is much larger than that made by the male, and the male larva seldom makes a roof as its hole is much smaller.

It is true that the imago has an extremely strong flight, and it seems to be more agile than a sphingid. I have seen it flying at Hakodate, Hokkaido (Yezo), at dusk, when the particular specimen I was observing ascended and descended in the air almost vertically, revolving all the time.

I cannot positively say whether my larva is actually that of *Phassus signifer* Walker or that of *Phassus excrescens* Butler form *æmulus* Butler, as no imago emerged, but it agrees very closely with the figures of the larva of *P. æmulus* given by Nawa and Sasaki and also with Sasaki's description. My larva, however, is longer, measuring 82 millimeters against Sasaki's 44 millimeters and Nawa's 46 millimeters. It is not impossible that *P. excrescens* Butler may prove to be a form of *signifer* Walker, which is recorded from Japan by Leech.

Phassus excrescens is named in Japanese *kōmoriga*, or bat moth, on account of its strong rapid flight which resembles that of a bat.

Pryer [28] comments on *P. æmulus* and *excrescens* as follows:

> Yokohama, very abundant; it emerges late in the autumn; large specimens measuring 4½ to 5 inches in expanse; it is very destructive, particularly to imported fruit-trees, in the stem of which it burrows two years; it is extremely prolific, the body of a full-sized female is two inches long, filled with minute eggs, which it scatters loosely about the tree it feeds on; I have found it in almost all trees except conifers; it often attacks vines, and prefers to burrow in the stem of a tree to which a wisteria [sic] or other climber is attached. The ichneumon that prays [sic] upon this insect is a most extraordinary one; the body is short and oval and measures ½ an inch, but the ovapositor [sic] is 9 inches long. Expanse of wings 1½ inches.

Leech [29] states that—

> *H. excrescens* is closely allied to the Indian *H. pauperatus* Walker; some of the Japanese specimens of the former have the "small black-edged white spots" and other characters of the latter.

Matsumura says that the larva of *Phassus excrescens* Butler feeds internally upon *niwatoko* [*Sambucus racemosus* Linnæus] and *kusagi* [*Clerodendron tricotomum* Thunberg]. He also

[28] Trans. Asiat. Soc. Japan 12 (1884) 40, No. 55.
[29] Proc. Zool. Soc. London (1888) 645.

states [30] that the very closely allied species *Phassus signifer* Walker, which occurs in Japan, also feeds internally on *kusagi* [*Clerodendron tricotomum* Thunberg], *kiri* [*Paulownia tomentosa* Thunberg], and *momo* [peach]. Possibly *P. excrescens* and its form *æmulus* Butler may eventually prove to be merely forms of *P. signifer* Walker which has priority. The larvæ of both *P. æmulus* and *signifer* inhabit the same trees, kusagi and kiri.

Y. Nawa [31] gives much interesting information about this species in an article entitled the "*Kusagi no Shinkuiga* [Kusagi wood-boring moth] (*Hepialus aemulua* [sic] But.) and superstitious beliefs." He says:

The larva [of *H. æmulus*], which is a wood-borer, lives inside the stems, or trunk, of the *kusagi* tree (*Clerodendron tricotomum* Thunberg), whence is derived its name of *kusagi no shinkuiga* [*kusagi* wood-boring moth]. It seems that the larva was, in former times, employed in the Chinese system of materia medica, then in vogue in Japan, as a cure for children's diseases. It is also known in various localities under the name of *kusagi no mushi* [*kusagi* grub], *kusagi no kikui mushi* [*kusagi* wood-boring grub], *tō no kimushi* [rattan? grub]; *tō-namushi*. It is reported that whenever wood cutters chanced to find the larvæ and to bring them into town people were accustomed to buy them with much eagerness for medicinal purposes.

Hiraga Kyūkei, in his work entitled Butsurui Hintō, states, in an article on the *kusagi* tree, that—"the *kuimushi* [boring grub]," which is found in trees is used in the treatment of children's convulsions for killing worms."

Ono Ranzan, in his work, Honkō Keimō, states in an article on wood borers that—

* * * the *kikui* [wood-boring grub] is a long grub which lives in the interior of trees and feeds upon them internally. It is like a mulberry worm [silkworm] in shape and its efficacy for curing diseases varies according to the tree which it inhabits. The *kusagi kuimushi* [*kusagi* boring grub] is steeped in soy, split into two halves and is then given to children. It is said to cure them of atrophy and convulsions.

Nawa proceeds to say:

I dare say that there is nothing extraordinary in the medicinal use of the larvæ of *kikui mushi* [wood borers] which in Japan inhabit trees, such as pine, peach, *katsura* [*Cercidiphyllum japonicum* Siebold and Zuccarini], willow, and mulberry, or of the larvæ of aquatic insects such as the *magotaro mushi* [*Neuromus grandis* Thunberg (Neuroptera)], and it may therefore have happened that the *kusagi no shinkui mushi* [larva of the *kusagi* wood-boring moth, *Hepialus æmulus*] was also given to children in the same

[30] Thousand Insects of Japan (Zoku Nihon Senchū Dzukai) (1911) suppl. 3, 54, Nos. 589 and 590, pl. 34, figs. 10, ♀, and 17, ♂.

[31] Insect World (Konchu Sekai) 5 (1901) 410, pl. 11, larva, pupa, imago ♂ ♀.

way for the cure of internal diseases, but it would probably be advisable not to enquire too closely into its efficacy for such purposes. Whereas, in former times, it was really only employed for one specific disease, nowadays a sort of superstition invests this kikui mushi [wood borer] with the virtue of being a valuable remedy for consumption. Dishonest local tradesmen have not lost this good opportunity. The virtues of *iki-ibota mushi* [live larvæ of *Brahmæa japonica*], as they are called, are openly advertised by them in their shop windows. They have met the demand of consumptive patients by energetically and publicly advertising their efficacy in their shop windows. This custom has arrived at such a stage that advertisements, similar to the one reproduced below, were to be seen blazoned in capital letters in the center of the City of Nagoya in April of this year [1901]. How appalling the ignorance of my countrymen must be concerning the nature of insects!

CONSUMPTION, NERVOUS DEBILITY, DYSPEPSIA.
AN ASTONISHING AND WONDERFUL DRUG!
IKI IBOTA MUSHI

> This grub has, hitherto, not been of frequent occurrence as a dried preparation. It is a live grub and when it moves is all alive and kicking. If only one dose of this grub be taken medicinally it completely cures consumption, however severe, dyspepsia, and nervous debility just as if it had been done by the Gods. There are many drugs in the world but this Iki Ibota mushi is especially efficacious.
>
> —— ——, Apothecary, City of Nagoya.

Previous to seeing this advertisement some persons had written to me from Hokkaido and two or three prefectures to report the existence of the *ibota mushi* [larva of *Brahmæa japonica*]. I imagined at the time they wrote to me that this must be either the *ibota mushi* which is the larva of the shokkō moth [*Brahmæa japonica*], or else, if that were not the case, that it must be the *ibotarō mushi* [*Ericerus pela* Westwood, wax-producing scale insect]; that is to say, a species of *kaigara-mushi*, which is used for oiling cloths and other purposes. Subsequently I read advertisements about *ibota-mushi-chō* [*Brahmæa japonica*, moth] and also personally saw similar advertisements in shop windows. I then understood for the first time that the previous report which I had received from Hokkaido did not refer to the *kaigara-mushi* [*Ericerus* species, wax-producing scale insect], but to the *kikui mushi* [*Hepialus æmulus*].

The imago of the *kusagi no shinkui ga* [*Hepialus æmulus*], generally emerges about September or October and usually flies at dusk. Its flight in the air is exceedingly swift, and owing to its large size in comparison with ordinary-sized species of moths a collector is often apt to mistake it for a kōmori [bat]. The female selects a soft part of the trunk or branches for oviposition, whereby it facilitates the boring of the young larvæ. The head of the larva, namely the *kikui-mushi* [wood-boring grub] is light brown, the abdominal legs are of a light yellowish white and it has altogether sixteen legs. When full-grown it measures 1 sun 4 or 5 bu [46.2 to 49.5 millimeters] long. As has already been stated this moth lives concealed inside trees in its larval stage and eats the internal tissue and it is therefore usually mistaken for the *teppōmushi* [gun barrel

grub], which is the larva of the *kamikiri-mushi* [a species of Coleoptera, probably a *Cerambyx* [*kamikiri* grub]. The larva of the *teppōmushi*, however, has only eight legs. Furthermore, the larva [of *Hepialus æmulus*] is always in the habit of ejecting its excrement from a certain part of the tree and of spinning fine silken threads around it, but the larva of the *kamikiri-mushi* is legless in front [and therefore cannot do this]. There is, moreover, special evidence that the larva of the *teppōmushi* lets its excrement fall out of a small aperture which is perforated in some part of the trunk or branches. By giving a little attention to the habits of these two different larvæ the difference between them is clearly understood. The larva of the *kikui mushi* [*Hepialus æmulus*] which inhabits the *kusagi* tree and also the *kiri* tree is quite different from that of the *teppōmushi* [a coleopter]. It causes much loss to horticulturists by the injury it inflicts on these trees. The pupa [of *æmulus*] measures 1 sun and 4 or 5 bu [46.2 to 49.5 millimeters] long, and 2 bu, 5 rin [6.76 millimeters] broad; cylindrical in shape; head and ventrum dark brown, the rest of the body light brown; it generally remains in the groove which it has scooped out. There is no perfect method for exterminating the larva of this moth. Some people kill them by piercing them with copper wire, others put hyakubukon [the root of *Stemona sessilifolia* Miq.] into their holes and wait for them to die. It is sometimes found useful to dissolve an insecticide and to inject it with a syringe, or else to await the flight of the moths at dusk and to capture and kill them. No other methods of extermination have been discovered so far, and there can be no hope of attaining good results in the case of *kiri* and *kusagi* trees unless these be adopted. Those engaged in horticulture must reflect on the matter. When the true character of the *iki-ibota-mushi*, which is welcomed by the public as a specific for consumption, is revealed we find that it is really nothing more than the *kikui-mushi* [*Hepialus æmulus*], to which we have previously alluded and that it is not the genuine *ibota mushi* [*Brahmæa japonica*], but an injurious grub which bores into *kiri* trees. No satisfactory explanation can be offered now as regards its efficacy in effecting the cure of diseases, but judging from the opinions of the two authors, Kyūkei and Ranzan, previously quoted, it is evident that it most certainly possesses no virtue for healing the lungs. Superstition may, indeed, be said to have reached the acme of absurdity, when we find an ignorant public disseminating infection on all sides through the continuance of this superstition and the neglect of proper medical treatment.

The imago of *H. æmulus* mimics a withered leaf when at rest, and Nawa represents it in this attitude with wings folded over the body. Sasaki [32] gives figures, descriptions, and a short life history of *Hepialus æmulus* Butler, which he names in Japanese *kiri no teppō-mushi chō* (the moth of the gun-barrel grub of the *kiri* tree). He says that—

* * * the imago appears between the end of August and the commencement of September and lays its eggs on the *kiri* (*Paulownia*

[32] Nihon Jūmoku Gaichuhen (Jap.) ed. 3, pt. 3 (1910) 3, pl. 163, larva, pupa, imago.

tomentosa Thunberg). The larvæ which hatch from these eggs enter the core of the tree and commence to feed upon it. It has not been discovered yet for how many years the larva remains inside the *kiri* tree, but probably it lives there for about two years in the larval stage. The larva generally changes into a pupa inside the tree between the end of July and August. The imago emerges at the commencement of September when it drops its eggs on the surface of the leaves. Many of the larvæ burrow into a hole situated at a place five or six feet between the junction of the root and the trunk and vigorously devour the core of the tree both in spring and summer. The larva pierces a small hole in the trunk from which the excrement exudes so that it can be ascertained by the state of the excrement on the surface of the trunk whether a larva is living inside or not. The *kiri* trees which are injured by this larva are perforated with many larva holes and much loss is caused thereby owing to the fact that it injures the core of the trunk and depreciates the value of the timber.

A full-grown larva[25] (4th stage?) measures 1 sun and 5 or 6 bu [about 49.5 to 52.8 millimeters] long; cylindrical in form; head large and round, reddish brown; cervical plate on segment 1 reddish brown, having on each side a black elliptical spot; the anterior half of each segment marked dorsally with a light reddish brown elliptical, or rectangular patch, the posterior half marked dorsally on both sides with a smaller elliptical patch; a reddish brown triangular spot above and behind each spiracle; a long reddish brown patch beneath each spiracle; three small reddish brown spots at the base of the abdominal legs, each spot emitting one or two hairs. I have taken a full-grown larva, but the posterior half of the body was injured and I was therefore unable to ascertain the exact full length. I believe, however, that the larva generally attains a length of over 2 sun [about 66 millimeters].

The head is over 2 bu and 5 rin [about 8.2 millimeters] in width. The head of a larva in the fourth stage is not more than 1 bu and 7 or 8 rin [about 3.53 to 3.56 millimeters] in width, so that one can ascertain whether a larva is full-grown or not by the size of the head.

The pupa is 1 sun and 7 or 8 bu [about 56.1 to 59.4 millimeters] in length; head, thorax and wing cases blackish brown; ventrum ashy yellowish brown; each abdominal segment provided ventrally and dorsally with hard, longitudinal, spiny skin folds. When the pupa is about to change into a moth it projects the anterior half of its body from the hole which has been made in the tree, and the imago emerges.

The ovum is globular, or elliptical; diameter 3 rin [about .09 millimeter]; black, glossy; usually the ova are laid singly on the surface of a leaf, and as they do not adhere to it they fall to the ground.

Local distribution.—Phassus excrescens and forma *æmulus*. Honshu, Musashi Province, Yokohama, April (*Wileman*): Musashi Province, Tokyo, October (*Wileman*): Mino Province, Gifu, September, October (*Nawa*). Hokkaido, Oshima Province, Tobetsu, September (*Wileman*). Kyushu, province?, locality?

[25] My larva measures 82 millimeters, much larger than Sasaki's measurements.—A. E. W.

(*Leech*). Matsumura records *P. excrescens* and forma *æmulus* from Hokkaido and Honshu.

Phassus signifer. Honshu, Musashi Province, Yokohama (*Pryer*) : Shinano Province, Oiwake (*Leech*) : Nagato Province, Shimonoseki (*Leech*) : Yamato Province, Yoshino, July (*Wileman*). Shikoku, Iyo Province, Ishidzuchi San, June (*Wileman*). Kyushu, Satsuma Province, locality? (*Leech*). Hokkaido, Oshima Province, Junsai Numa, Hakodate, July (*Wileman*). Matsumura records *signifer* from Honshu and Kyushu.

Time of appearance.—Phassus excrescens and forma *æmulus* larva probably takes two years to undergo its metamorphoses and, therefore, lives throughout the year; the imago in April, August, September, October. *Phassus signifer,* imago, June, July; larva, so far undiscovered, perhaps identical with that of *excrescens* = *æmulus.* Pryer says of *P. signifer,* "Yokohama, emerges in the summer, rather scarce."

General distribution.—Phassus excrescens: Eastern Siberia (Amurland) ; Japan (*Matsumura, Leech*). *Phassus signifer:* India; Burma; Borneo (*Hampson*). Korea; central, western, and northeastern China; Japan (*Leech*). *Phassus excrescens,* type from Yokohama (*Jonas*) ; forma *æmulus,* type from Yokohama (*Jonas*). Both are in the British Museum collection.

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ILLUSTRATIONS

[Drawings by Hisashi Kaidō.]

Plate 1

Figs. 1 to 3. *Oreta pulchripes* Butler forma *calceolaria* Butler. *1*, larva; *2*, head and thoracic segment; *3*, food plant.

4 to 6. *Oreta calida* Butler. *4*, larva; *5*, head; *6*, food plant.

7 to 9. *Zygæna niphona* Butler. *7*, larva, dorsal aspect; *8*, larva, lateral aspect; *9*, food plant.

10 to 12. *Cnidocampa flavescens* Walker. *10*, larva, *11*, cocoon; *12*, food plant.

Plate 2

Figs. 1 to 3. *Paranthrene regale* Butler. *1*, larva, lateral aspect; *2*, larva, dorsal aspect; *3*, food plant.

4 and 5. *Phassus excrescens* Butler. *4*, larva of forma *æmulus?* Butler; *5*, roof over hole of female larva.

PLATE 1. JAPANESE LEPIDOPTERA.

PLATE 2. JAPANESE LEPIDOPTERA.

DIE TENEBRIONIDEN (COLEOPTERA) DES INDO-MALAYISCHEN GEBIETES, UNTER BERUECKSICHTIGUNG DER BENACHBARTEN FAUNEN, VIII

DIE GATTUNGEN ANISOCARA, SPILOSCAPHA, MENIMUS, LABIDOCERA, UND PENTAPHYLLUS

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EINE TAFEL

Genus **ANISOCARA** novum

Von der Gestalt der schwarzen *Platydema*-Arten, oval, gewölbt, nackt.

Der Kopt ist in beiden Geschlechtern sehr verschieden, beim Männchen und Weibchen flach ausgehöhlt, beim Männchen vorn spitz und stark vorgezogen, der ganze Rand scharf aufgebogen, das Epistom mit Spitze versehen, zwischen den Augen befinden sich zwei ungleiche, aufrechte, nach hinten gerichtete Hörner. Die Augen sind gross, quer, von den Wangen weit durchsetzt, ihr oberer Teil ist schräg nach vorn gerichtet, beim Weibchen finden sich statt der Hörner scharfe Tuberkeln. Die Oberlippe ist sehr scharf quer gekielt, die Gelenkhaut ist deutlich. Die Fühler sind schlank, 11-gliedrig, Glied 3 ist zylindrisch, viel länger als 4, vom fünften an sind die Glieder erweitert, die Sinnesporen finden sich hauptsächlich an der Spitze der Glieder. Der Hals ist dick. Auf der Unterseite des Kopfes bleiben die Augen vom Maxillarausschnitt durch einen ziemlich breiten Zwischenraum getrennt. Dass Kinn ist so breit wie lang, leicht gewölbt, beim Männchen ohne Grube. Die Labialpalpen sind sehr klein, das Endglied der Maxillarpalpen ist dreieckig, die Mandibeln sind am Ende scharf und lang zweispitzig.

Der Halsschild ist in beiden Geschlechtern gleich, er ist sehr stark quer, alle Ecken sind kurz verrundet, an der Basis finden sich vier deutliche Grübchen statt der gewöhnlichen zwei.

Die Flügeldecken sind leicht gefurcht, die Epipleuren vollständig. Die Unterseite ist wie bei *Platydema* gebildet, das

Prosternum ist wagerecht und hat einen scharf senkrecht absturzenden Fortsatz, das Mesosternum ist V-förmig ausgeschnitten, der Abdominalfortsatz spitz, die beiden letzten Segmente sind an der Basis leicht quer gefurcht. Die Beine haben beim Männchen keine Auszeichnung, die Schenkel sind mässig dick, die Schienen gerade, aussen mit scharfer, aber sehr zart krenulierter Kante. Die Vordertarsen des Männchens haben keine erweiterten Glieder. Die Tarsen sind dünn und lang, an den hinteren ist Glied 1 etwas länger als 2 + 3.

Diese Gattung ist aufs nächste mit *Platydema* verwandt und könnte als recht abweichende Art aufgefasst werden, wenn nicht die höchst eigentümliche Kopfbildung des Männchens wäre. Das weit vorgezogene, spitze Epistom und das verlängerte dritte Fühlerglied sind Merkmale die sich bei *Platydema* nicht finden, wohl aber bei *Ischnodactylus*, von dem sich unsere Gattung durch stark gewölbten Körper, ganz andere Bewaffnung des Kopfes, beim Männchen nicht mit Grube versehenes Mentum, stark gerandeten Abdominalfortsatz unterscheidet. Die vier Grübchen an der Basis des Pronotums finden sich bei keiner mir bekannten Diaperiden-Gattung wieder.

Anisocara gynandromorpha sp. nov. Tafel 1, Fig. 1.

Oval, stark gewölbt, glänzend schwarzbraun, Fühler und Beine rotbraun. Der Kopf des Männchens ist breit, aber flach ausgehöhlt, der Vorderkopf lang spitzbogig vorgezogen, die Mitte des Epistoms mit Zähnchen versehen, der ganze Rand stark aufgebogen. Die Stirn ist vorn ungefähr 1.5 mal so breit wie ein Auge von oben gesehen, die Wangen sind viel schmäler als die Augen und engen sie bis über die Mitte ein, die Punktierung ist fein und regelmässig. Am Innenrand der Augen erheben sich zwei lange, schräg nach hinten gerichtete, also über den Vorderrand des Pronotums gelegte Hörner, die etwas divergieren: das linke ist wesentlich länger als das rechte, am Ende verrundet und dort mit Haarbekleidung versehen, das linke ist zuerst parallelseitig, verengt sich plötzlich spitz und hat keine Behaarung, beide Hörner sind kantig. Beim Weibchen ist der Vorderkopf über halbkreisförmig gerundet, die Ränder sind nicht deutlich aufgebogen, die Mitte des Epistoms ist leicht angedeutet, die Quernaht ist gut ausgeprägt, halbkreisförmig, die Stirn flach grubig vertieft, am Innenrand der Augen befinden sich zwei feine, spitze Tuberkeln. Die Fühler sind dünn, erreichen aber die Basis des Pronotums nicht. Der Halsschild ist stark quer,

flach gewölbt, die Basis ist an den Hinterecken nicht vorgezogen, diese sind also rechteckig, aber verrundet, die Spitze ist von oben gesehen leicht ausgeschnitten, die Vorderecken sind sehr breit verrundet stumpfwinklig. An der Basis finden sich ausser den beiden gewöhnlichen länglichen Grübchen noch zwei weitere etwas mehr nach innen, beim Männchen davor auf der Scheibe noch zwei rundliche Eindrücke, die aber vielleicht individuell sind. Die Punktierung ist sehr deutlich, wenig dicht, gleichmässig.

Die Flügeldecken sind fein gefurcht, die Furchen werden hinten tiefer und gehen bis zur Spitze durch; die Punkte der Streifen sind ausserordentlich fein und dicht gedrängt, die Zwischenräume sind besonders hinten gewölbt, sehr fein punktiert und im Grunde mikroskopisch fein lederrunzlig. Die Decken sind stark gewölbt und fallen an den Seiten senkrecht, hoch ab, doch ist die Randkante von oben sichtbar. Unterseite und Beine sind in der Gattungsbeschreibung dargestellt.

Länge, 6.5 bis 7.5 Millimeter; Breite, 3.6 bis 4.

Ein Pärchen von Java Occidental, Pengalengan, 4,000 Fuss (*H. Fruhstorfer*), im Museum Dahlem.

Die Art ist durch die eigentümliche Kopfbildung des Männchens sehr ausgezeichnet, das Weibchen sieht einem *Platydema* sehr ähnlich, ist aber an dem Fühlerbau als eigene Gattung zu erkennen.

Genus **SPILOSCAPHA** Bates

Spiloscapha Bates, Entom. Monthly Mag. 9 (1873) 202.

Spiloscapha nigrofasciata sp. nov.

Oval, glänzend rotbraun, auf den Flügeldecken mit einem helleren Fleck hinter der Mitte der Basis und dahinter einer breiten, schwarzen Binde, auch die Fühlerglieder bis auf die ersten schwarz.

Kopf in der Längsrichtung schwach gewölbt, querüber flach. Augen weit getrennt, von den sehr schmalen Wangen bis zur Mitte oder etwas darüber geteilt. Der Vorderkopf ist stark und geradlinig verengt, die ganze Oberfläche sehr blank, fein und nicht dicht, etwas ungleich punktiert, die Ecken des Epistoms mit leichten Grübchen. Die Fühler werden zur Spitze dicker, Glied 1 bis 3 sind rotbraun, die andern schwarz. Glied 3 ist so breit wie lang, nicht zylindrisch; vom vierten an sind die Glieder allmählich stärker quer, die vorletzten sind 1.5 mal so breit wie lang, das elfte ist oval, viel länger als breit.

Der Halsschild ist an der Basis kaum doppelt so breit wie in der Mittellinie lang, die Seiten sind deutlich und ziemlich stark nach vorn gerundet verengt, die Seitenrandkehle ist mässig breit, von oben gesehen ragen die Vorderwinkel nicht vor, sie sind in der Randkante kurz verrundet rechtwinklig. Die Basis ist fast gerade abgestutzt, nur die Mitte ist leicht bogig vorgezogen. Die Punktierung ist sehr fein und nicht dicht.

Die Flügeldecken sind bunt (dreifarbig), doch sind die Farben nicht scharf begrenzt. Der helle Fleck hinter der Basis ist quer und hebt sich nur hinten gegen die schwarze Binde scharf ab; diese berührt den Seitenrand nicht, geht aber über beide Decken, den Nahtstreifen kaum heller lassend. Es sind scharf eingeschnittene, hinten sogar furchige Punktstreifen vorhanden, deren Punkte fein und rund sind. Die Zwischenräume sind vorn fast flach und mit ganz vereinzelten, kräftigen Punkten versehen. Bis zur Schulter sind alle Streifen entwickelt, daneben findet sich an der Seite, von der schwarzen Binde an, ein weiterer Streif.

Die Unterseite ist sehr fein punktiert, das Prosternum ganz wagerecht, hinten flach, halbkreisförmig verrundet, jederseits neben den Hüften äusserst fein gerandet; das Mesosternum liegt auch hinten etwas tiefer als das Metasternum und hat vorn eine starke Beule.

Länge, 3.8 Millimeter.

Zwei Exemplare von Singapore (*H. Ridley*) im Britischen Museum, von denen mir eines für meine Sammlung überlassen wurde.

Diese Art ist der *Spiloscapha javanicum* sehr ähnlich, aber anders gezeichnet, hat nicht vorragende Vorderecken des Pronotums und kräftig gefurchte Decken. Ausser diesen beiden Arten liegt mir eine dritte in einem einzelnen, defekten, unsauberen Exemplar von den Philippinen aus dem Britischen Museum vor, das ich nicht zu beschreiben wage. Sie ist der obigen Art täuschend ähnlich, hat aber nicht gefurchte Decken und etwas andere Zeichnung.

Spiloscapha javanicum sp. nov.

Körper schmal oval, rot, Oberseite mit schwarzen Flecken, glänzend, Unterseite, Beine, und die ersten drei Fühlerglieder rotgelb, die übrigen schwarz.

Der Kopf ist flach, auch an den Seiten, die Wangen sind also nicht aufgebogen, die Seiten des Vorderkopfes sind etwas nach

aussen gebogen verengt, aber der Vorderkopf ist nicht halbkreisförmig, das Epistom ist in der Mitte gerade abgeschnitten, die Verbindungsnaht zwischen Epistom und Oberlippe ist breit. Die Punktierung ist dicht und sehr fein, aber deutlich. Die Wangen sind viel schmäler als die Augen. Die Fühler sind lang und dick. Glied 3 ist konisch, viel länger als dick, 4 und alle folgenden sind quer, die vorletzten reichlich 1.5 mal so breit wie lang, das letzte ist breit oval, länger als breit. Das Kinn ist flach, trapezisch, vorn kaum breiter als in der Mittellinie lang.

Der Halsschild ist 2.5 mal so breit wie lang, kräftig gewölbt, der Seitenrand ist gleichbreit, scharf abgesetzt verflacht, die Seitenrandkehle setzt sich in derjenigen der Flügeldecken fort, stösst aber winklig auf sie. Basis und Spitze sind ungerandet, der Vorderrand ist kräftig ausgeschnitten, die Ecken sind verrundet rechtwinklig, die hinteren scharf. Die Punktierung ist fein und mässig dicht, die basalen Grübchen sind rundlich, wenig auffällig. Die Farbe ist bei einem Exemplar rotgelb, bei dem andern findet sich jederseits ein grosser, dunkler Basalfleck.

Die Flügeldecken haben eine schmale, schwarze Basis und in oder hinter der Mitte eine breite, quere Binde, die aber hinten nicht begrenzt ist, sondern ganz verschwommen. Die Skulptur ist eigentümlich: der Nahtstreif ist hinten stark gefurcht, es sind nur die ersten fünf oder sechs Punktreihen ausgebildet, sie sind sehr fein, etwas unordentlich, Zwischenräume 3 und 5 sind vorn doppelt so breit wie 2 und 4, hinter der Mitte sind die Interstitien gleichbreit, ihre Punktierung ist doppelt, es finden sich etwas gröbere Punkte, die so stark sind wie die der Streifen und sehr viel feinere. Die Seiten der Decken sind ganz verworren punktiert. Die Epipleuren sind weit vor der Spitze verkürzt.

Die Unterseite ist fein und mässig eng punktiert, das Prosternum ganz wagerecht, vorn querüber breit verrundet, hinter den Hüften mit breitem, am Ende halbkreisförmigen Fortsatz. Das Mesosternum ist ziemlich scharfkantig, aber breit und flachbogig eingedrückt, der Abdominalfortsatz ist sehr breit, nicht gerandet, die Beine sind ziemlich lang, nicht ausgezeichnet. An den Hintertarsen ist Glied 1 etwas kürzer als der Rest.

Länge, 4 Millimeter.

Zwei Exemplare aus dem Museum Dahlem, von denen mir eines für meine Sammlung überlassen wurde.

Java Occidental, Pengalengan, 4,000 Fuss (*Fruhstorfer*).

Ich sehe keinen Grund diese und die vorige Art von der australischen Gattung zu trennen. Deren Verbreitung ist daher recht interessant. Aus dem papuanischen Gebiet, von woher mir ein reiches Material vorlag, ist mir keine Art bekannt. Unsere Art stimmt mit der australischen *Spiloscapha thalloides* nicht nur in allen Gattungscharakteren überein, sondern auch in Gestalt und Färbung, die nur wenig anders ist. Doch ist *javanicum* kleiner, anders gezeichnet, die ganze Basis der Decken ist schwarz, während bei *thalloides* nur jederseits des Schildchens sich ein Fleck findet, ferner ist die schwarze, hinten sehr schlecht begrenzte Binde in oder hinter der Mitte, bei der australischen Art vor der Mitte. Ganz abweichend ist die Skulptur der Decken: die paarig genäherten Punktreihen und die doppelte Punktierung der Zwischenräume.

Uebrigens ist die Gattung *Spiloscapha* dem *Scaphidema* ausserordentlich nahe verwandt und kaum generisch verschieden. Bates führt zahlreiche Unterschiede an, die aber fast ausnahmslos gradueller Natur sind. Es fehlt bei *Spiloscapha* die Metallfarbe, die Fühlerglieder sind schon vom vierten an erweitert, die Seiten des Halsschildes sind nicht trapezisch sondern gerundet, in der Endhälfte fast parallel.

Genus MENIMUS Sharp

Menimus SHARP, Ent. Monthly Mag. 13 (1876) 73.

Ebensowenig wie Lewis habe ich irgendwelche Zweifel dass die nachfolgenden asiatischen Arten in die sonst rein neu-seeländische Gattung *Menimus* zu stellen sind. Eine neue Art, leider nur ein Exemplar liegt mir aus dem Britischen Museum von Neu-Guinea vor. Nicht nur die äussere Aehnlichkeit ist sehr gross, auch in scheinbar nebensächlichen, artlichen Merkmalen und besonders in selten auftretenden Eigentümlichkeiten zeigt sich die generische Zusammengehörigkeit; so der feine Ausschnitt an den Hinterecken des Pronotums, die zottige Behaarung an den Tarsen, die Dörnchen auf deren Unterseite, die nur 10-gliedrigen Fühler, die winzigen Augen, etc. Fühler von zehn Gliedern hat unter den Diaperiden nur noch *Paita* Fauvel von Neu-Caledonien, eine Gattung die *Menimus* sehr ähnlich sein muss, aber bei ihr soll das erste Glied der Hintertarsen lang sein, länger als die beiden folgenden zusammen, und das Mesosternum ist stumpf vorgezogen, bei unserer Gat-

tung liegt es tief zwischen den Hüften, ist schmal, rinnenförmig eingedrückt, und lässt die Hüften vorn frei.

Neue Beschreibung der Gattung.—Lang oval, oder parallelseitig, stark gewölbt, Unterflügel verkümmert oder (vermutlich bei mehreren neu-seeländischen Arten) fehlend. Der Kopf ist frei, sehr dick, in beiden Geschlechtern gleich; die Augen sind sehr klein, ganz an den Seiten liegend und meist etwas nach vorn gerichtet. Der Hals ist dick und setzt keine eigentliche Schläfe ab, die Quernaht vorn ist fein oder undeutlich, der Vorderkopf ist einfach verengt, das Epistom gerade abgestutzt oder ausgebuchtet, die Oberlippe ist ganz flach, sehr gross, eine Gelenkhaut zwischen ihr und dem Epistom fehlt, ebenso ein Querkiel. Die Fühler sind kurz und meist dick, 10-gliedrig, mit 3 bis 5-gliedriger Keule, sie sind lang behaart. Auf der Unterseite des Kopfes nehmen die Mundteile nur etwas mehr als ein Drittel der Breite ein, der Raum zwischen Auge und Maxillarausschnitt ist sehr breit. Das Mentum ist verschieden gebildet, bei den asiatischen Arten meist mit spitzer Tuberkel versehen, oder es ist gekielt oder (bei *niponicus*) ganz flach. Das Endglied der Maxillarpalpen ist dreieckig, das der Labialpalpen lang zylindrisch und spitz. Die Mandibeln sind an der Spitze ausgeschnitten. Der Halsschild ist an den Seiten (Ausnahme *niponicus*) mit breiter Randkehle versehen, die Hinterecken sind scharf rechtwinklig, aber ihre Spitze ist abgestutzt oder meistens sehr fein, winklig ausgeschnitten. Der Vorderrand ist gerade abgeschnitten oder in der Mitte leicht vorgezogen, die Basis ist ungerandet.

Das Schildchen ist quer dreieckig. Die Flügeldecken sind stark gewölbt, meist irregulär punktiert oder mit nicht gut und gleichmässig ausgebildeten Punktreihen. Die Epipleuren sind verkürzt.

Das Prosternum ist meist verlängert und spitz, zuweilen aber hinten etwas niedergedrückt und dann erst mit Spitze versehen. Das Mesosternum liegt sehr tief zwischen den Hüften, es ist schmal, der Eindruck geht bis an das Metasternum, die Mittelhüften sind sehr gross und daher vorn frei. Die Hinterbrust ist kürzer als der Durchmesser einer Hüfte. Die bei den Tenebrioniden gewöhnliche Querfurche vor den Hinterhüften ist sehr zart. Der Abdominalfortsatz ist breit, die Gelenkhaut zwischen den letzten Segmenten ist deutlich. Die Beine sind mässig lang, die Schenkel ziemlich dünn, die Schienen gerade, in beiden Geschlechtern gleich, hinten nicht mit feiner,

krenulierte Kante versehen. Die Tarsen sind sehr lang behaart, die vorderen und mittleren auf der Sohle gewöhnlich mit Dörnchen versehen, an den Hintertarsen ist das erste Glied kürzer als das Klauenglied.

Herr Blair, der mir zwei Stücke der neuen Art *M. blairi* aus Neu-Guinea mitteilte, bezeichnete sie als *Enanea* Lewis spec. und bemerkt brieflich, dass *Enanea* sich von *Menimus* durch 4-gliedrige Fühlerkeule unterscheide. Durch diese Notiz erst wurde ich auf die Gattung *Enanea* aufmerksam gemacht, die mir in Natur unbekannt ist. Der Autor stellt sie zu den Ulomiden. Leider übergeht die Beschreibung, wie bei fast allen seinen Tenebrioniden-Gattungen, die wesentlichen Merkmale. Ich habe aber keinen Zweifel dass der sorgfältig beobachtende Blair sie richtig identifiziert. Aber in einem Merkmal weicht *Enanea* sicher von *Menimus* ab: sie hat spitz dreieckig aufgebogene Wangen beim Männchen, auch ist die Fühlerkeule nicht deutlich abgesetzt. Wegen des ersteren Merkmals zögere ich *Enanea* mit *Menimus* zu vereinigen. Was die Bildung der Fühlerkeule betrifft, so scheint mir dieses Merkmal nicht ausreichend die Gattungen zu trennen, denn bei den neu-seeländischen Arten sind nicht immer drei gut abgesetzte Glieder vorhanden und die unten neu aufgeführten Arten schwanken gerade in der Fühlerbildung sehr. Auch die Ausrandung des Epistoms, die oftmals stark, dann schwächer ist und bei andern Arten fehlt, darf kaum als Gattungscharakter angesehen werden. Würde ich Fühler- und Epistombildung zur Aufstellung neuer Gattungen benutzen, so würden wir eine Anzahl sehr artenarmer Gattungen haben, die in dem einen Hauptmerkmal, den 10-gliedrigen Fühlern, übereinstimmen, das sie von allen andern gut scheidet. Ich glaube aber dass wir uns vorläufig mit den beiden Gattungen (zu denen *Paita* von Neu-Caledonien als dritte kommt) begnügen, bis die Entdeckung von zahlreichen neuen Arten es wünschenswert erscheinen lässt, eine weitere Trennung vorzunehmen.

Uebersicht über die asiatischen Arten von Menimus Sharp.

1. Halsschild an den Seiten gerundet, Körper etwas parallelseitig, Flügeldecken einfarbig braun, ohne Spur von Metallschimmer ..... 2.
   Halsschild trapezisch, Seiten gerade, Körper oval, nach hinten erweitert, Flügeldecken deutlich metallisch. Vorderindische Arten ..... 5.
2. Länge, 2.25 Millimeter, Hinterkörper sehr stark gewölbt, Seitenrand der Decken von oben nur ganz vorn sichtbar, Halsschild grob punktiert, Mentum quer, ganz flach. (Japan.) ..... **M. niponicus Lewis.**

Drei Millimeter und grösser, ganz parallel, Seitenrand der Decken mindestens in der Vorderhälfte sichtbar, Halsschild fein punktiert, Mentum gewölbt oder mit starker Tuberkel ..... 3.

3. Sechs Millimeter und grösser, Pronotum oben rauh, besonders beim Männchen, Fühlerkeule mit schwach queren Gliedern, lang. (Ceylon.)
M. rugicollis sp. nov.

Drei bis 4.5 Millimeter gross, Pronotum oben glatt, fein punktiert, Fühlerkeule mit stark queren Gliedern ..... 4.

4. Drei Millimeter lang, hellbraun, Epistom in tiefem Bogen ausgeschnitten, die Clypealsutur leicht eingedrückt. (Philippinen; Neu-Guinea.)
M. blairi sp. nov.

Vier bis 4.5 Millimeter lang, schwarzbraun, Epistom in flacherem Bogen ausgeschnitten, die Clypealsutur leicht erhaben. (Java.)
M. kraepelini sp. nov.

5. Hinterkörper sehr stark gewölbt, sein Seitenrand von oben nur dicht hinter der Schulter sichtbar, Halsschild nicht mit lederartiger Grundskulptur ..... **M. indicus sp. nov.**

Hinterkörper flacher, sein Seitenrand von oben bis zur Mitte sichtbar, Halsschild mit lederartiger Grundskulptur ..... 6.

6. Fühler mit 4-gliedriger Keule, Kinn mit deutlichem Längskiel, Hinterecken des Halsschildes mit kleinem, scharfwinkligem Ausschnitt.
M. ovalis Allard.

Fühler mit 5-gliedriger Keule, Kinn mit Höcker, die Ecken des Halsschildes sind abgeschnitten ..... **M. caraboides Allard.**

Menimus niponicus Lewis.

Menimus niponicus Lewis, Ann. & Mag. Nat. Hist. VI 13 (1894) 398.

Zur Beschreibung des Autors füge ich nach dem einzigen mir vorliegenden Exemplar (Cotype!) einige Ergänzungen hinzu:

Die Augen sind sehr klein und ragen seitlich kaum aus der Wölbung des Kopfes, die Wangen sind nicht wie bei *kraepelini*, zum Beispiel, zuerst parallel und dick, sondern geradlinig bis zum Vorderrand des Kopfes verengt; das Epistom ist nicht ausgeschnitten, sondern gerade abgestutzt. Der Halsschild ist gleichmässig und sehr stark gewölbt, die Seitenrandkehle ist viel schmäler als bei den andern Arten, der Hinterrand ist von Ecke zu Ecke in sehr breitem Bogen stark nach hinten gezogen, also nicht gerade abgestutzt; auch der Vorderrand ist vorgezogen, er hat keine Randlinie, die Vorderecken sind kurz verrundet rechtwinklig, der Einschnitt der Hinterecken ist sehr schwach und undeutlich. Die Punktierung ist wie die des Kopfes grob und sehr vereinzelt. Die Flügeldecken sind in beiden Richtungen stark gewölbt, der Seitenrand ist von oben nur dicht hinter der Schulter zu sehen. Das Kinn ist ganz flach, ohne Tuberkeln, stark quer. Dornen an den Tarsen konnte ich ohne mikro-

skopisches Präparat nicht erkennen; ich wollte aber das einzige mir vorliegende Exemplar nicht zerlegen.

Länge, 2.25 Millimeter.

Japan.

Durch die geringe Grösse, das nicht ausgerandete Epistom, das ganz flache, stark quere Kinn, die sehr grobe Punktierung, den hinten in starkem Bogen vorgezogenen Halsschild von den andern mir bekannten Arten verschieden.

Menimus kraepelini sp. nov.

Ziemlich parallelseitig, glänzend dunkelbraun, stark gewölbt.

Der Kopf ist dick, in der Mitte flach, an den Seiten gewölbt, die winzigen Augen sind kreisrund, nach aussen fast halbkugelförmig gewölbt, die Wangen sind zuerst parallelseitig und liegen vor der Mitte der Augen, sie sind sehr dick. Die Punktierung ist weitläufig und ziemlich grob, ungleichmässig, vorn am Epistom grob und etwas runzlig. Die Gegend der Quernacht ist leicht erhöht, sie selbst ist nur in der Mitte angedeutet; von den Wangen an ist der Vorderkopf geradlinig stark verengt, und hat an den Seiten, ungefähr in der Mitte, einen winzigen Einschnitt. Das Epistom ist in breitem Bogen sehr sanft ausgeschnitten, die Ecken ragen nur schwach und undeutlich, nicht lappenartig vor. Die Fühler sind sehr kurz, die Glieder eng geschlossen, Glied 3 ist so breit wei lang, 4 schwach quer, 5 etwas stärker, 6 ist 1.5 mal so breit wie lang, die letzten vier bilden eine gut abgesetzte Keule, 7 bis 9 sind 2.5 mal so breit wie lang. Das Kinn ist quadratisch und hat eine sehr hohe, glänzende, runde, oben mit winzigem Porenpunkt versehene Tuberkel.

Der Halsschild ist ungefähr 1.5 mal so breit wie lang, querüber sehr stark gewölbt. Die Seitenrandkehle ist breit, nach vorn etwas verschmälert. Der Vorderrand ist fast gerade abgestutzt, in der Mitte nur ganz leicht vorgezogen, die Randlinie ist dort vollständig; der Hinterrand ist beinahe gerade abgeschnitten, die Hinterecken sind scharf rechtwinklig, sehr fein ausgeschnitten, die Seitenrandkante ist äusserst leicht gekerbt, die grösste Breite liegt eben hinter der Mitte, von dort sind die Seiten nach hinten schwach, nach vorn stark verengt. Die Punktierung ist sehr fein, wenig eng, gleichmässig, viel feiner als die des Kopfes, der Grund ist mikroskopisch fein lederrunzlig, aber glänzend.

Die Flügeldecken sind stark gewölbt, besonders hinten, die Seitenrandkante ist nur in der ersten Hälfte von oben sichtbar.

Die Decken sind fast parallel, von vorn bis zur Mitte nur ganz schwach erweitert, die Punktreihen sind nur in der Vorderhälfte deutlich, die Punkte ziemlich grob, nicht ganz gleichmässig, von der Mitte an allmählich erloschen. Die Zwischenräume sind flach, mit einzelnen, zum Teil in Reihen gestellten, etwas feineren Punkten besetzt.

Das Prosternum ist vorn querüber in starkem Bogen gewölbt, hinten gesenkt und mit Spitze versehen, also nicht, wie bei den andern Arten, wagerecht. Das Mesosternum ist wie gewöhnlich rinnig vertieft und liegt tief zwischen den Hüften, ist also sehr schmal und bis zur Hinterbrust eingedrückt, die Mittelhüften sind vorn ganz frei. Die Beine sind dick, die Sohlen haben die normalen kleinen Zäpfchen, sie sind sehr klein und meist in der langen Behaarung versteckt.

Länge, 4.1 bis 4.4 Millimeter; Breite, 2.1 bis 2.2.

Fünf Exemplare in den Sammlungen Hamburg, Gebien, Veth.

Java, Preanger (*Sijthoff*); Tjibodas, 25ten bis 28ten März, 1904 (*Kraepelin*).

Diese Art unterscheidet sich von denen des indischen Festlandes durch den nicht trapezischen Halsschild und die nicht metallischen Decken, kürzere Fühler, und mehr ausgebildete Punktstreifen, ferner durch das nicht wagerechte Prosternum. Sie ist neben *rugicollis* zu stellen, die aber über 6 Millimeter gross ist, durch eigentümliche Halsschildskulptur und ganz andere Fühler ausgezeichnet ist.

Menimus blairi sp. nov.

Sehr klein, parallelseitig, glänzend hellbraun, nackt.

Der Kopf ist sehr gross, flach, die Augen sind winzig klein, nach vorn gerichtet; die sehr langen Schläfen sind so dick wie die Augen und bestimmen deren Richtung. Die Wangen treffen in der Mitte auf die Augen, sie sind stark gewölbt, von ihnen an ist der Vorderkopf stark, geradlinig, ohne sichtbaren Einschnitt verengt. Die Quernaht ist nicht erhöht, sondern sehr fein eingedrückt. Das Epistom ist in starkem Bogen ausgeschnitten, sein Rand läuft der Quernaht parallel und wird von einer Reihe gröberer Punkte begleitet; sonst ist die Punktierung ziemlich fein. Die Fühler sind kurz und haben eine geschlossene, 4-gliedrige Keule von stark queren Gliedern, Glied 3 ist so lang wie breit.

Der Halsschild ist querüber stark gewölbt, ungefähr doppelt so breit wie in der Mittellinie lang, die Basis ist fast gerade

abgestutzt, die Mitte des Vorderrandes sehr leicht vorgezogen, die Seitenrandkehle ist nach vorn verschmälert, im übrigen dick, die äusserste Randkante ist kaum wahrnehmbar fein krenuliert. Die Punktierung ist fein und weitläufig.

Die Flügeldecken sind parallelseitig, stark gewölbt, die Seitenrandkante ist von oben sichtbar, sie ist ausserordentlich fein gesägt (durch fein eingedrückte Borstenpünktchen). Es sind Reihen ziemlich grober Punkte vorhanden, nur der Seitenabsturz ist irregulär punktiert. Die Zwischenräume sind ganz flach und mit einzelnen Punkten besetzt, ebenso gross wie die der Reihen.

Das Prosternum ist zwischen den Hüften sehr schmal, liegt etwas vertieft und ist hinten ganz niedergedrückt. Auf der Unterseite des Kopfes hinter den Augen befindet sich eine Gruppe grober Punkte. Die Mittelbrust liegt ganz vertieft. Das Abdomen ist entweder mit einzelnen groben Punkten besetzt und sehr deutlich lederrunzlig, oder (bei den Tieren von Tacloban) fast glatt. Das Analsegment ist querüber leicht vertieft und mit einzelnen gröberen Punkten versehen. Die Zäpfchen an den Sohlen sind kaum sichtbar.

Länge, 3 bis 3.2 Millimeter.

Sieben Exemplare. Philippinen: Leyte, Tacloban; Luzon, Laguna; Paete (*W. Schultze*). Ferner Neu-Guinea, Misol, aus dem Britischen Museum, ex coll. Pascoe und coll. Sharp.

In den Sammlungen London, Schultze, und Gebien.

Die sehr kleinen, leider nicht ganz sauberen, auf Karton geklebten Tiere machten eine Untersuchung der Unterseite schwer. Es ist also nicht ausgeschlossen, dass die Tiere so verschiedener Herkunft sich doch als verschiedene Arten ausweisen. Die Tiere von Tacloban, auch die von Misol, haben eine scharfe Tuberkel auf dem Mentum, während die Stücke von Paete ein sanft gewölbtes und jederseits leicht grubig vertieftes Kinn haben, ferner zeigen die ersteren einige grobe Punkte auf dem Abdomen, die andern nicht. Da im übrigen die Tiere in allen Hauptmerkmalen übereinstimmen (dem tief bogig ausgeschnittenen Epistom, der Fühlerbildung, der Skulptur, der parallelseitigen Form, dem niedergedrückten Prosternum), so lasse ich sie als Angehörige einer variablen Art gelten.

Unsere Art hat unter den Asiaten als nächsten Verwandten den *M. kraepelini* aus Java, ist aber viel kleiner, hellbraun, und hat ein tief ausgeschnittenes Epistom, ferner nicht eine leicht erhöhte Clypealsutur. Auf den ersten Blick noch ähnlicher ist eine neue Art von den Philippinen, die mir in einem Einzelstück

aus dem Britischen Museum vorliegt. Sie entfernt sich aber weit durch winziges Mentum, stark schräge abgeschnittene Glieder der Keule, gerade abgestutztes Epistom, fast gefurchte Flügeldecken, und sehr breite, vorn nicht verschmälerte Randkante des Pronotums. *Menimus niponicus* aus Japan ist noch kleiner, mehr oval, hat grob punktierten Halsschild, queres Mentum, gerade abgestutztes Epistom, und wagerechtes Prosternum.

Menimus rugicollis sp. nov. Tafel 1, Fig. 2.

Lang oval, fast parallelseitig, mässig gewölbt, glänzend braun, nackt.

Der Kopf ist sehr gross und dick, hinter den Schläfen sehr schwach eingeengt. Die Augen sind sehr klein, liegen ganz an den Seiten und sind nach unten sehr schwach ausgezogen, sie werden durch die Wangen nicht eingeengt. Diese sind etwas schmäler als die Augen, dick, von dort ist der Vorderkopf stark und einfach verengt, die Ecken des Epistoms sind scharf, der Vorderrand ist in breitem Bogen ausgerandet. Die Quernaht ist sehr fein, aber nicht eingedrückt, sondern dort ist der Kopf etwas erhaben. Die Stirn ist flach, stark, etwas länglich, nicht eng punktiert, vorn auf der Wölbung gerunzelt. Die Oberlippe ist gross, ganz flach, und mit dem Epistom nicht durch eine Gelenkhaut verbunden. Die Fühler sind dick und kurz, lang behaart, Glied 2 ist ziemlich viel kürzer als 3, 3 gleicht 4, 5 ist so breit wie lang, 6 ist schwach quer, die letzten vier sind deutlicher quer, eine Keule ist also nicht gut abgesetzt. Auf der Unterseite sind die Mundteile von den Augen durch einen Zwischenraum abgesetzt, der fast so breit ist wie die Mittelpartie. Das Kinn ist quer, trapezisch, mit einer sehr hohen, spitzen Tuberkel versehen. Das Endglied der Labialpalpen ist sehr lang zylindrisch, das der Maxillarpalpen dreieckig, diese Palpen sind auf dem Grundteil mit einzelnen, langen Haaren versehen.

Der Halsschild ist ungefähr 1.5 mal so breit wie lang, an den Seiten kräftig gewölbt, oben etwas flachgedrückt, die Mittellinie ist leicht eingedrückt, die Punktierung wenig eng, sehr deutlich, die Scheibe beim Weibchen schwach, beim Männchen stark gerunzelt, die Runzeln sind erhaben, verworren, kurz. Die grösste Breite liegt ungefähr in der Mitte, nach hinten sind die Seiten schwach, nach vorn stärker verengt, die Seitenrandkante ist breit, der äusserste Rand sehr leicht uneben. Die Hinterecken sind kurz abgeschnitten, nicht mit deutlichem Ausschnitt versehen, die vorderen sind kurz verrundet. Das Schildchen ist breit dreieckig.

Die Flügeldecken sind parallelseitig, sie haben einige deutliche Punktreihen, aber nur auf der Scheibe, während die seitlichen undeutlich sind, die Zwischenräume sind ganz flach und ebenso grob und weitläufig punktiert wie die Streifen. Die Epipleuren sind vor der Spitze verkürzt.

Die Unterseite zeigt einzelne kurze Haare. Prosternum und Mesosternum sind zwischen den Hüften sehr schmal, das erstere ist vorn etwas, hinten mehr gesenkt, dann wagerecht, die Spitze ist prononziert. Die Hüften liegen höher als das Prosternum. Das Mesosternum ist bis zum Metasternum eingedrückt und liegt ganz vertieft. Die Propleuren sind nur ganz hinten leicht ausgehöhlt. Die Hinterbrust ist zwischen den Hüften kürzer als der Durchmesser einer Hüfte. Das Abdomen ist kräftig und etwas rauh, nicht eng punktiert. Die Schenkel sind ziemlich dick, die Schienen gerade, die Tarsen kurz, die vorderen und mittleren mit sehr langen, zarten Haaren besetzt. Auf der Unterseite sind die ersten vier Tarsenglieder in einen spitzen Zapfen ausgezogen, der sich unter das folgende Glied schiebt, wodurch die Glieder ganz schräge abgeschnitten erscheinen.

Länge, 6 bis 6.6 Millimeter.

Zwei Männchen, 2 Weibchen, von Ceylon (*Nietner*) im Museum Stettin und in meiner Sammlung.

Dies dürfte die grösste Art der Gattung sein. Sie ist von allen mir bekannten Arten durch den Sexuel-Dimorphismus auf dem Pronotum verschieden, von den nächsten drei Arten durch den parallelen Körper und den nicht trapezischen Thorax. Am nächsten steht M. *kraepelini*, ist aber viel kleiner, hat ganz andere Skulptur des Pronotums und anderen Fühlerbau.

Menimus ovalis Allard. Tafel 1, Fig. 3.

Chariotheca ovalis ALLARD, Naturaliste (1894) 104.

Oval, ziemlich flach, glänzend braun, Flügeldecken deutlich metallisch, Fühler und Beine rötlich.

Der Kopf ist gross, vorn beim Beginn des Epistoms deutlich gewölbt, die Quernaht ist nur bei starker Vergrösserung als feine, glänzende Linie sichtbar. Die Wangen sind sehr dick, aber viel schmäler als die Augen. Die Punktierung ist ziemlich fein, das Epistom hat rundlich vorgezogene Ecken. Die Fühler sind schlank, die ersten fünf Glieder dünn, 3 ist länger als 4, 4 and 5 sind gleich gross, 6 ist etwas grösser, so breit wie lang, die letzten vier bilden eine gut abgesetzte Keule von grossen Gliedern, die aber nur wenig quer sind. Das Kinn hat einen leichten

Mittelkiel und jederseits ein Grübchen, aber keinen Zapfen. Der Unterkopf hinter den Mundteilen ist querüber leicht vertieft.

Der Halsschild ist genau trapezisch, die Seiten sind von der Basis an geradlinig verengt; die Seitenrandkehle ist stark, die Spitze ist fast gerade abgestutzt, nur ihre Mitte ist leicht rundlich vorgezogen, die Basis ist gerade; die Hinterecken sind in der Breite der Randkehle ziemlich scharfwinklig ausgeschnitten. Die Punktierung ist sehr fein, wenig eng, und hat einzelne gröbere Zwischenpunkte, der Grund ist mikroskopisch fein lederrunzlig.

Die Flügeldecken sind verhältnismässig flach, so dass die Seitenrandkante von oben fast vollständig übersehbar ist, ausnahmsweise (ein Weibchen) sind die Seiten der Endhälfte überdeckt. Nur die inneren drei bis fünf Punktreihen sind auf der Scheibe deutlich, die äusseren in der gröberen Punktierung der Zwischenräume ganz geschwunden; auch hinten sind keine Punktreihen ausgebildet.

Das Prosternum ist ganz wagerecht und hat einen sehr langen, spitzen Fortsatz, es ist oben ungerandet. Die Mittelbrust ist bis zur Hinterbrust eingedrückt, so dass die Vorderseite der Hüften freiliegt. Die Beine sind dünn, die Zapfen an den Sohlen der vorderen Beinpaare sind sehr klein, die Behaarung ist lang.

Länge, 5.2 bis 5.9 Millimeter; Breite, 2.3 bis 3.

Sieben Exemplare in den Sammlungen Dahlem und Gebien.

Südindien: Trichinopoly; Madura; Shembaganur; Khasias.

Die Auffassung dieser Art als die *Chariotheca ovalis* Allard bedarf der Rechtfertigung. Dass der Autor diese oder die nächste Art bei der Beschreibung vor sich gehabt hat bezweifle ich nicht; dem widerspricht nur die Bemerkung dass sieben deutliche Streifen vorhanden seien, bei meinen Tieren sind zwar die äusseren Punkte hin und wieder reihig angeordnet, aber eigentliche Punktlinien sind nicht entwickelt. Uebrigens könnte Allard's *C. caraboides* auf unsere Art gedeutet werden. Dass der Verfasser von elf Fühlergliedern spricht darf nicht wundernehmen. Er wird überhaupt nicht gezählt haben und rechnet daher vom elften Gliede an rückwärts, weil aber die meisten Tenebrioniden elf Glieder haben. Solche Flüchtigkeit ist bei ihm nicht selten. Ich erinnere an *Ischnodactylus*. Hier gibt er in der Gattungsbeschreibung zehn Glieder an und bei seiner Art *I. batesi* zwölf Glieder. Es sind aber stets elf Glieder vorhanden. Noch unglaublicher klingt es dass Allard eine echte

Chrysomela als Tenebrionide beschreibt, nämlich als *Diphyrrhynchus*.[1] Ich habe mich für die vorliegende Art und nicht für die folgende entschieden weil Allard von vier ausgebildeten Punktstreifen spricht. Ein endgültiger Entscheid kann nur nach Konsultation der Typen erfolgen.

Menimus caraboides Allard.

Chariotheca caraboides ALLARD, Naturaliste (1894) 104.

Auf diese Art deute ich ein Exemplar meiner Sammlung von Madura, Südindien. Sie ist der vorigen Art täuschend ähnlich, so dass auf eine ausführliche Beschreibung verzichtet werden kann; sie unterscheidet sich aber sicher durch ganz anderen Fühlerbau: die letzten fünf Glieder bilden eine gut abgesetzte Keule, das Kinn hat statt des niedrigen Längskieles einen scharfen Höcker, die Hinterecken des Halsschildes sind nicht kurz ausgeschnitten, sondern sehr kurz schräg abgestutzt, die Dornen auf der Sohle der vorderen Tarsen sind ganz undeutlich.

Länge, 5.6 Millimeter; Breite, 2.7.

Menimus indicus sp. nov.

Sehr kurz oval, hinten sehr stark gewölbt, glänzend braun, die Flügeldecken metallisch.

Der Kopf ist sehr dick, in der Längsrichtung leicht gewölbt, eine Quernaht ist auch unter starker Vergrösserung nicht zu erkennen, die Augen sind wie bei den vorhergehenden beiden Arten schräg nach vorn and zur Seite gerichtet, klein, rund, die sehr dicken Wangen sind viel schmäler als die Augen. Die Punktierung ist sehr fein, vorn, besonders auf dem Clypeus, befinden sich einige grobe Punkte; die Ecken des Epistoms ragen leicht und kurz lappenförmig vor. Die Fühler sind kurz, Glied 4 ist kugelig, 5 etwas quer, die letzten fünf Glieder bilden eine gut abgesetzte Keule, deren Glieder stark quer sind, doch ist das erste Glied der Keule kleiner als die folgenden. Das Kinn hat keine Tuberkel, sondern ist vorn sehr stark gewölbt, und hat einen feinen Mittelkiel, daneben keine eigentlichen Grübchen.

Der Halsschild ist trapezisch; die Seitenrandkehle ist breit, vorn aber verschmälert. Die Hinterecken sind sehr kurz, winklig ausgeschnitten; der Grund des Halsschildes ist nicht wie bei den beiden vorhergehenden Arten mikroskopisch lederrunzlig, sondern glatt, er ist äusserst fein punktiert, und ausserdem sind

[1] Lesne, Bull. Soc. Ent. Fr.

einige gröbere Punkte vorhanden. Auf der Scheibe finden sich zwei flache Grübchen; die Vorderecken sind kurz verrundet stumpfwinklig, die Mitte des Vorderrandes ist ganz leicht vorgezogen.

Die Flügeldecken sind in der Mitte am breitesten, von dort ist der Seitenrand des Körpers bis zu den Vorderecken des Halsschildes geradlinig verengt. Der Hinterkörper ist so stark gewölbt dass die Seitenrandkante nur dicht hinter der Schulter von oben sichtbar ist. Nur die ersten Punktreihen sind erkennbar, der ganze seitliche Teil der Decken ist verworren punktiert.

Der Prosternalfortsatz ist sehr lang und spitz, das ganze Prosternum wagerecht, der Eindruck des Mesosternums reicht wie gewöhnlich bis zum Metasternum und ist furchig vertieft, die Hüften liegen vorn bloss. Die Beine sind länger als bei der vorigen Art.

Länge, 5 Millimeter; Breite, 2.6.

Ein Exemplar in meiner Sammlung (von Staudinger und Bang-Haas erworben).

Indien, Madras.

Diese Art bildet mit den beiden vorhergehenden Arten eine besondere Gruppe in der Gattung, ausgezeichnet durch den trapezischen Halsschild und die metallische Flügeldecken. Von *ovalis* unterscheidet sich *indicus* durch sehr stark gewölbten Hinterkörper, dessen Seitenrandkante nur ganz vorn von oben sichtbar ist, durch ganz andern Fühlerbau, nicht lederartige Grundskulptur des Pronotums, und kürzere Beine. Von *caraboides*, der ähnliche Fühler hat, unterscheidet sich unsere Art durch den stark gewölbten Hinterkörper, das nicht mit Zäpfchen versehene Kinn, und den nicht mit lederartiger Grundskulptur versehenen Halsschild.

Genus **LABIDOCERA** novum

Geflügelt, Hinterkörper parallel, kurz, gelbbraun, ganzer Leib behaart.

Der Kopf ist sehr gross, beim Männchen sanft eingedrückt, beim Weibchen flach, die Augen sind winzig klein, durch die Wangen nicht eingeengt, rund, die Schläfen liegen hinten plattenförmig an und richten die Augen nach vorn, diese sind fein fazettiert. Die Fühler sind höchst eigenartig, 11-gliedrig, das erste Glied ist ausserordentlich gross, beim Weibchen schräge abgeschnitten, beim Männchen so lang wie der Kopf, am Ende hakenförmig nach innen gebogen, und die folgenden Glieder setzen sich an der Seite des ersten Gliedes an, etwa in der

Mitte, es ist eine starke, aber nicht plötzlich abgesetzte Keule vorhanden, das zweite Glied ist dicker als das dritte, dieses ist beim Männchen kugelig, beim Weibchen länglich, zylindrisch, die vorletzten Glieder sind sehr stark quer, das letzte hat eine blanke Basis von halber Gliedlänge und eine etwas dreieckige, matte Spitze. Die Oberlippe ist winzig klein, nicht durch eine Gelenkhaut mit dem Epistom verbunden. Auf der Unterseite des Kopfes ist zwischen Auge und Maxille ein Raum breiter als der Mundausschnitt. Das Kinn ist quer, flach, die Maxillarpalpen haben ein stark beilförmiges letztes Glied, das Endglied der Labialpalpen ist spindelförmig. Die Mandibeln sind am Ende kurz ausgeschnitten.

Der Halsschild ist sehr stark quer, beim Weibchen so breit, beim Männchen breiter als die Flügeldecken. Die Basis ist ungerandet, alle Ecken sind breit verrundet, der Vorderrand ist gerade abgeschnitten. Das Schildchen ist an den Seiten parallel, das Ende halbkreisförmig verrundet.

Die Flügeldecken sind parallelseitig, stark gewölbt, verworren punktiert, die Epipleuren sind vollständig, aber an der Spitze sehr schmal.

Das Prosternum ist sehr schmal, hinten wagerecht, die Vorderhüften sind deutlich quer, schräg nach vorn gerichtet, die Vorderhüfthöhlen sind hinten offen. Die Mittelbrust ist sehr lang, flach, ohne Ausschnitt zwischen den Hüften, dort viel tiefer liegend als diese, und sehr schmal. Das Metasternum ist nicht länger als der Durchmesser einer Hüfte, die Gelenkhöhlen der Mittelhüften sind an den Seiten offen und haben einen winzigen Trochantinus. Die Hinterbrust ist hinten fein gerandet, der Abdominalfortsatz ziemlich schmal und mässig spitz, die Gelenkhaut zwischen den letzten Segmenten ist deutlich. Die Schenkel sind sehr dick und kurz, unten tief ausgehöhlt, die Vorderkante ist schneidig scharf, höher als die hintere. Die Schienen sind gerade, sie haben sämtlich eine Aussenendecke. Die Tarsen sind zart.

Diese neue Gattung ist von hohem Interesse. Die Bildung der Vorderbrust, das heisst, die hinten offenen Vorderhüfthöhlen, ist ein Charakter von grossem systematischen Wert. Man kannte jahrzehntelang nur eine Tenebrioniden-Gattung welcher dieses Merkmal zukommt, nämlich *Boros*, die eben wegen dieser Eigentümlichkeit von mehreren Autoren von den Tenebrioniden abgetrennt wurde; Thomson stellte sie zu den *Pythiden*. Alle neuren Systematiker möchten aber in *Boros* nur eine aberrante

Tenebrioniden-Gattung sehen. Später hat Winkler noch die blinde Tenebrioniden-Gattung *Osphyoplesius* aufgefunden, die ebenfalls hinten offene Vorderhüfthöhlen hat. Ich glaube dass bei sorgfältiger Durchsicht der exotischen Gattungen sich noch mehr Gattungen finden werden. Mir sind jetzt die folgenden Gattungen bekannt: *Boros, Osphyoplesius, Aposyla, Tanylipa, Labidocera,* ferner eine neue Helopiden-Gattung *Catamoneurus,* Reitter (in litt.), ausserden die ganze Unterfamilie der Erodiinen, ferner die Cryptochilinen. Einige Bemerkungen zu diesen Tieren dürften nicht überflüssig sein. Bei den Erodiinen ist das Merkmal der offenen Gelenkhöhlen nicht auffällig, denn bei ihnen ist eine weitgehende Verschmelzung des Skelettes eingetreten, so dass das Prosternum von dem Mesosternum nicht abgebogen werden kann; vermutlich haben daher die älteren Autoren geglaubt dass unterhalb der Trennungsnaht zwischen Prosternum und Mesosternum sich ein Abschluss der Hüfthöhlen finden würde, was nicht der Fall ist. *Aposyla* aus Australien, äusserlich unsern *Boros* sehr ähnlich, hat nicht getrennte Vorderhüften, es fehlt also eine Wand zwischen den Hüften, und dieser Charakter zwingt uns die Gattung überhaupt aus der Familie der Tenebrioniden herauszunehmen und sie den Lagriiden zuzuweisen.

Aber auch, abgesehen von dem Merkmale der offenen Vorderhüften, ist unsere Gattung durch den fast beispiellosen Fühlerbau ausgezeichnet. Das erste Glied ist ausserordentlich verlängert, beim Weibchen schräg abgeschnitten und die folgenden Glieder sind an der schrägen Seite eingelenkt, beim Männchen dagegen ist das gewaltig verlängerte erste Fühlerglied hakenförmig und die folgenden Glieder sind in der Mitte des Gliedes eingelenkt. Auf den ersten Anblick könnte man geneigt sein dieses erste Glied für die stark verlängerten Mandibeln zu halten. Nähere Verwandtschaft mit irgend einer andern Gattung besteht nicht.

Ich verzichte darauf auf diese neue Gattung eine eigene Unterfamilie zu errichten, die nur aus dieser Gattung und dieser Art besteht; sie wäre aber viel berechtigter als viele andere.

Labidocera abnormis sp. nov. Tafel 1, Fig. 4.

Kurz, ziemlich parallel, glänzend braun, aber durch ziemlich dichte Behaarung etwas matt.

Der Kopf ist sehr gross und breit, beim Männchen der ganzen Breite nach leicht vertieft. Die Augen sind sehr klein, ihr Innenrand gebogen, die Wangen sind dick und glänzend, der

ganze Kopf ist leicht und deutlich punktiert, das Epistom ist stumpfwinklig vorgezogen. Beim Weibchen ist der Kopf sanft gewölbt. Das erste Fühlerglied des Männchens (siehe die Gattungsbeschreibung) ist sehr lang, hornförmig, gekantet, auf der Innenseite leicht geschwollen, aussen direkt unter der Einlenkungsstelle der folgenden Fühlerglieder leicht winklig abgesetzt, das letzte Ende ist scharfwinklig geknickt und nach innen gerichtet, auch dieses hornartige erste Glied ist fein behaart. Das Ende der Fühler bildet eine starke, aber schlecht abgesetzte Keule; die vorletzten Glieder sind sehr stark quer, etwas becherförmig, Glied 2 der Fühler ist grösser und dicker als 3.

Der Halsschild ist beim Männchen breiter als die Flügeldecken, Hinterecken fehlen ganz, die Seiten sind stark gerundet und gehen direkt in die Basis über, die Querwölbung ist stark, die Seiten fallen steil ab, doch ist die Seitenrandkante von oben sichtbar, sie ist mit einer schmalen, scharfen Randkehle versehen. Die Vorderecken treten, von oben gesehen, ganz leicht vor, sind aber ebenfalls verrundet, die basalen Grübchen sind sehr breit und ganz undeutlich, die Punktierung ist sehr dicht und fein, gleichmässig.

Die Flügeldecken sind in der Basalhälfte ganz parallelseitig, sie sind ebenfalls dicht und gleichmässig, sehr fein verworren punktiert. Die Punkte sind etwas reibeisenartig, das heisst, sie haben einen scharfen Vorderrand. Jeder hat ein schräg nach hinten gerichtetes, etwas anliegendes, goldgelbes Härchen. Die Schulterecken sind breit verrundet rechtwinklig. Die Seitenrandkante ist von oben vollständig überdeckt. Ueber die Unterseite ist in der Gattungsbeschreibung nachzulesen.

Länge, 2.5 bis 3.2 millimeter.

Mentawei, Si-Oban, April bis August, 1894 (*E. Modigliani*). Java, Tjompea, 11ten März, 1904 (*W. Kraepelin*).

Vier Männchen, 2 Weibchen, in den Sammlungen München, Hamburg, und Gebien (Typen)! Doch muss die Art auch im Museum Kopenhagen vertreten sein, von dem ich sie tauschte.

Genus PENTAPHYLLUS Latreille [2]

Pentaphyllus LATREILLE, Regne Anim. II, V (1829) 30.

Von dieser Gattung sind aus dem indo-malayischen Gebiet bisher drei Arten beschrieben, alle von Borneo; ausserdem ist eine Art von Japan bekannt, die mir leider nicht vorliegt. Die

[2] Weitere Literaturangaben siehe Gebien: Col. Cat. par 28, p. 387.

meisten Arten aus dem tropischen Afrika und Asien sind beim Männchen in mannichfaltiger Weise gehörnt, und unterscheiden sich dadurch von den nordischen Arten.

Auf eine Beschreibung der Gattung kann verzichtet werden, sie ist ausführlich mehrfach erfolgt. Est ist möglich dass eine oder die andere Art, welche Motschulsky als *Hoplocephala* beschrieb, hierher gehört, aber nicht gerade wahrscheinlich, da er alle seine Arten gestreift punktiert nennt. Sicher ist aber *Hoplocephala* (*Arrhenoplita*) *pygmaea* Champion aus Australien ein echter *Pentaphyllus*.

Uebersicht über die asiatischen Arten der Gattung Pentaphyllus Latreille.

1. Die ganzen Wangen des Männchens sind stark zahnförmig, dreieckig aufgebogen, Stirn neben den Augen langgrubig vertieft, Vorderschienen stark gestachelt. (Philippinen.) ..... **P. spinipes sp. nov.**
   Die Wangen sind nie zahnförmig aufgebogen, wohl aber findet sich häufig ein Zähnchen an den Ecken des Epistoms. Stirn neben den Augen nicht breit gefurcht, Schienen fein gestachelt oder glatt ..... 2.
2. Pronotum vorn gerandet; Arten nackt, lackglänzend, Männchen mit Hörnchen oder Spitzchen auf dem Epistom ..... 3.
   Pronotum vorn ungerandet; Arten fein anliegend behaart, matt glänzend, Männchen höchstens mit zwei konischen Tuberkeln entfernt vom Vorderrand des Epistoms ..... 7.
3. Flügeldecken tief gefurcht. (Borneo.) ..... **P. striatus Gebien.**
   Flügeldecken ohne Spur von Streifen ..... 4.
4. Oberseite einfarbig, oder die Decken nur ganz undeutlich hellgefleckt.. 5.
   Oberseite hellgelb mit schwarzer Deckenbasis oder schwarz mit je zwei hellen Binden auf den Decken ..... 6.
5. Flügeldecken mit je einer etwas helleren Binde vorn, die Ecken des Epistoms beim Männchen nur leicht spitzchenförmig, nicht hornartig aufgebogen, Punktierung fein, die Punkte scharf eingestochen. (Mentawei.) ..... **P. mentaweicus sp. nov.**
   Flügeldecken ganz einfarbig, die Ecken des Epistoms beim gut entwickelten Männchen mit Hörnchen, Punktierung gröber, aber flach. (Borneo.) ..... **P. 4-cornis Gebien.**
6. Körper schmal, gelb, Deckenbasis schwarz. (Ceylon.).. **P. basalis sp. nov.**
   Körper breit, schwarz, Decken mit je zwei hellen Binden. (Neu-Guinea.) **P. bifasciatus sp. nov.**
7. Körper kurz, Männchen mit zwei konischen Tuberkeln auf dem Clypeus, Prosternum hinten nur leicht gesenkt, dann scharf senkrecht abgeschnitten. (Borneo; Philippinen.) ..... **P. biconiger Gebien.**
   Körper zylindrisch, länger, Männchen ohne Tuberkeln. Prosternum bis zum Grunde heruntergedrückt; mit Kiel am Absturz. (Java.) **P. inermis sp. nov.**

Pentaphyllus basalis sp. nov.

Ziemlich schlank, etwas flach zylindrisch, gelb, der Hinterkopf und die Basis der Flügeldecken schwarzbraun, Körper fast

nackt, äusserst kurz, sehr sparsam, etwas schuppenförmig behaart.

Der Kopf ist auf der Stirn beim Weibchen mit einer breiten flachen Grube versehen, beim Männchen dagegen sehr tief eingedrückt, die Grube des Weibchens deutlich punktiert, beim Männchen glatt. Die Wangen schnüren die Augen deutlich etwas ein. Beim Männchen erhebt sich jederseits innen neben den Augen ein kurzes, senkrechtes, konisches Horn, das nackt ist, beim Weibchen finden sich dort zwei rundliche Tuberkeln, das Epistom ist im ersteren Geschlecht mit spitzen, etwas aufgebogenen, aber nicht hörnchenartigen Ecken versehen, beim Weibchen ist der Vorderteil des Kopfes ungefähr halbkreisförmig vorgezogen. Die Fühler haben eine gut abgesetzte 5-gliedrige Keule deren Glieder stark quer, oben sehr scharfkantig sind, Glied 3 ist viel länger als breit, 4 und 5 sind etwas kugelig, so breit wie lang, 6 ist leicht quer. Das Kinn ist stark gehöckert, die grob fazettierten Augen treten unten nahe an den Maxillarausschnitt.

Der Halsschild ist querüber fast zylindrisch gewölbt, doch ist die Seitenrandkante von oben der ganzen Länge nach sichtbar. Die Seiten sind sanft gerundet, Vorder- und Hinterrand gerade abgestutzt, die Ecken sind breit verrundet. Die Punktierung ist zwar fein, aber sehr deutlich, nicht gedrängt, einfach. Die Breite ist nicht ganz doppelt so gross wie die Länge.

Die Flügeldecken sind an der Basis schwarzbraun, der Fleck ist etwas dreieckig, das heisst, am Schildchen viel breiter als an den Seiten. Die Punktierung ist äusserst fein, ganz verworren, aber die Decken sind durchscheinend und man erkennt daher Reihen von Punktflecken, die bei flüchtiger Betrachtung Punktreihen vortäuschen können. Die Seitenrandkante ist von oben nicht zu erkennen. Das Prosternum ist hinter den Hüften wagerecht.

Länge, 2.1 bis 2.2 Millimeter.

Zwei Männchen von Ceylon (*Nietner*) im Museum Berlin, das mir ein Exemplar für meine Sammlung überliess. Ein Weibchen von Ceylon, Nalanda (*W. Horn,* 1899) im Museum Dahlem.

Diese gelbe Art ist an der Färbung leicht zu erkennen. Die Kopfbildung des Männchens ist ähnlich wie bei *striatus* und *4-cornis,* doch ist bei diesen beiden Arten die Stirn nicht so tief eingedrückt, und die Ecken des Epistoms sind hornartig. Die Färbung ist ganz anders, der Körper viel schmäler. *Pentaphyllus striatus* hat überdies gefurchte Decken.

Pentaphyllus bifasciatus sp. nov.

Kurz elliptisch, etwas depress, der wagerechte Querdurchmesser also wesentlich grösser als der senkrechte, glänzend schwarz, Flügeldecken mit zwei roten Querbinden, Fühler und Beine rotbraun, Unterseite schwarz, Körper nackt.

Der Kopf des Männchens ist der Länge nach kräftig ausgehöhlt, vorn quer eingedrückt, am Innenrand der Augen finden sich zwei senkrecht aufgesetzte, kräftige, spitze, nackte, gleiche Hörner, die Stirn ist weit über doppelt so breit wie ein Auge von oben gesehen, das Epistom ist in breitem Bogen verrundet und hat jederseits ein winziges aufgesetztes Zähnchen. Die Punktierung ist äusserst fein, in der Punktierung kaum sichtbar. Beim Weibchen fehlt die Stirngrube, nur der Quereindruck ist vorhanden, ebensowenig sind Hörnchen und Spitzchen des Epistoms ausgebildet. Die Punktierung ist ziemlich weitläufig. äusserst fein. Die Fühler sind dick und haben eine stark abgesetzte, 5-gliedrige Keule, Glied 3 ist etwas länger als 4, 4 und 5 sind klein, so breit wie lang, 6 schwach quer, die letzten fünf sind stark in die Quere gezogen und ziemlich dicht aufeinander geschlossen, oben sehr scharfkantig.

Der Halsschild ist stark quer, fällt an den Seiten senkrecht ab. Die Spitzenrandung ist vollständig. Der ganz schwach vorgezogene basale Mittellappen hat auch in der Mitte keine Spur von Randlinie oder Aufbiegung. Alle Ecken sind breit verrundet, die Mitte des Vorderrandes ist in starkem Bogen vorgezogen. Die Punktierung ist sehr scharf aber fein und wenig dicht, das Schildchen ist rechtwinklig dreieckig.

Die Flügeldecken sind ganz irregulär, etwas gröber als der Halsschild punktiert. Jede Decke hat zwei quere, nicht gezackte, ziemlich schmale Binden, die vom Seitenrand wagerecht über die Decken gehen, aber vor der Naht aufhalten. Die Binden sind ungefähr so breit wie der schwarze Raum vor der vorderen. Die Seitenrandkante ist von oben nicht sichtbar. Die Unterseite ist blank, schwarz, das Prosternum ist hinten gerundet gesenkt, die Propleuren sind der ganzen Länge nach ausgehöhlt.

Länge, 2.1 bis 2.2 Millimeter.

Zwei Pärchen von Neu-Guinea, Dorey, im Britischen Museum und im Museum München; 1 Exemplar, in meiner Sammlung.

Die schwarze Farbe und die beiden hellen Querbinden auf den Decken unterscheiden diese Art von allen Gattungsgenossen.

Pentaphyllus mentaweicus sp. nov.

Sehr kurz elliptisch, nicht parallelseitig, schwach flach gedrückt, nicht eigentlich zylindrisch, Oberseite lackglänzend braun, Flügeldecken vorn mit einer ganz verwaschenen, oft undeutlichen hellen Querbinde, Fühler und Beine gelbbraun.

Der Kopf des Männchens hat zwischen den Augen zwei senkrechte, spitze, aber nicht sehr lange Hörner, ferner sind die Ecken des Epistoms leicht zähnchenartig aufgebogen, nicht eigentlich gehörnt. Die Stirn ist beim Männchen kräftig grubenförmig, eingedrückt, spiegelblank, mit kaum einer Spur von Pünktchen, der Vorderkopf ist halbkreisförmig, die Stirn ist vorn doppelt so breit wei ein Auge von oben gesehen. Beim Weibchen fehlt jede Spur von Eindruck auf der Stirn, doch ist die Querfurche gut ausgeprägt. Die Fühler haben eine dünne Wurzel, Glied 3 ist etwas länger als breit, konisch, 4 und 5 sind so breit wie lang, sehr klein, 6 ist etwas quer, die letzten fünf bilden eine stark abgesetzte Keule von sehr stark queren Gliedern, deren obere Kante sehr scharf ist, das letzte Glied hat eine abgesetzte dünnere Spitze. Das Kinn ist stark gewölbt, fast gehöckert. Zwischen Auge und Maxillarausschnitt bleibt ein Zwischenraum, breiter als das dritte Fühlerglied lang.

Der Halsschild ist stark gewölbt, aber die Seitenrandkante ist von oben breit sichtbar, die Seiten sind stark gerundet, die Ecken ganz abgerundet, die Basis ist ungerandet und nirgend aufgebogen, die Spitzenrandung ist vollständig, aber äusserst fein, der Vorderrand ist leicht bogig vorgezogen. Die Punktierung ist sehr scharf, aber ausserordentlich fein und wenig dicht.

Die Flügeldecken sind stark gewölbt, die Seitenrandkante ist nur dicht hinter der Schulter gut von oben sichtbar, weiter hinten überdeckt. Die Oberfläche ist verworren punktiert, die Punkte sind so weitläufig und fein wie die des Halsschildes. Vorn findet sich eine gelbliche, ziemlich undeutliche Querbinde, die aussen breiter ist als innen und die Naht nicht erreicht. Da die Flügeldecken etwas durchscheinend sind, erkennt man Reihenflecken von der Unterseite her.

Die Unterseite ist fast nackt, das Prosternum wie gewöhnlich in sehr breitem Bogen stark ausgeschnitten, zwischen den Hüften schmal, hinten stark gesenkt und hat dann einen scharfen, senkrechten Absturz. Die Mittelbrust ist schmal und liegt tief. Die Hinterbrust ist vorn stark gerandet, der Rand aufgebogen, die Brust wird durch eine kurze Längsfurche von hinten her

geteilt, der Abdominalfortsatz hat ebenfalls einen stark aufgebogenen Rand. Beine ohne Auszeichnung.

Länge, 2.5 bis 2.9 Millimeter.

Zwölf Exemplare in den Sammlungen Dahlem, München, und Gebien (Typen !).

Mentawei, Si-Oban, April bis August, 1894, und Sipora, Mai bis Juni, 1894 (*Modigliani*).

Diese Art schliesst sich in der Körperform und dem starken Glanz an die vorige, unterscheidet sich aber sofort durch Färbung und Zeichnung; die vordere Binde ist, da der Körper sehr hell ist, undeutlich.

Pentaphyllus 4-cornis Gebien.

Pentaphyllus 4-cornis GEBIEN, Saraw. Mus. Journ. 2 (1914) 23.

Pentaphyllus 4-cornis ist der vorigen Art sehr ähnlich, doch sind bei gut entwickelten Männchen die Zähnchen des Epistoms hornartig, die Punktierung der Oberseite ist gröber, aber die Punkte sind flach, eine Querbinde auf den Decken fehlt, ausserdem ist der Körper länglicher.

Borneo, Banguey. Mentawei, Si-Oban.

In den Sammlungen Gebien (Typen !) und Dahlem.

Pentaphyllus striatus Gebien.

Pentaphyllus striatus GEBIEN, Saraw. Mus. Journ. 2 (1914) 22.

Die Bewaffnung des Kopfes beim Männchen weist dieser Art einen Platz an neben den vorhergehenden, sie ist ebenfalls braun glänzend, nackt, aber sie ist von allen mir bekannten Arten durch die gefurchten Decken verschieden. Die Punkte in den Furchen sind nicht regelmässig gestellt, sondern unordentlich.

Borneo, Banguey.

In meiner Sammlung.

Pentaphyllus biconiger Gebien.

Pentaphyllus biconiger GEBIEN, Saraw. Mus. Journ. 2 (1914) 23.

Diese kleine Art ist viel näher mit den beiden europäischen Arten als mit den Asiaten verwandt, sie ist wie diese fein behaart, matt glänzend, der Halsschild ist vorn nicht gerandet, sie unterscheidet sich durch die Kopfbildung des Männchens, dieses hat auf dem Clypeus (nicht am Vorderrand des Epistoms) zwei konische, kräftige Tuberkeln.

Borneo, Banguey, in meiner Sammlung. Philippinen, Palawan, Puerto Princesa. Luzon, Los Baños (*Baker 7008, 5998, 8493*).

Dieser Art nahe verwandt ist eine neue aus Ceylon (*Nietner*), von welcher mir leider nur ein einziges Exemplar vorliegt, das ich nicht zu beschreiben wage, doch sind hier zwei kräftige Hörner vorhanden und der Körper ist lang zylindrisch, bei *biconiger* dagegen sehr kurz, auch sind die Augen grösser, ferner ist die Punktierung dichter und daher ist der Körper matt.

Pentaphyllus inermis sp. nov.

Hellbraun, zylindrisch (im Querdurchmesser kreisförmig), mattglänzend, Körper nicht sehr dicht mit anliegenden, goldgelben Härchen bekleidet.

Kopf in beiden Geschlechtern einfach, ungehörnt, Stirn flach, ohne Tuberkeln, zwischen den Augen nicht ganz doppelt so breit wie ein Auge. Die Augen sind gross, grob fazettiert, durch die Wangen nicht eingeengt. Die Querfurche ist ein kräftiger Eindruck, der hinten flach ist; die Wangen sind sehr kurz, die Seiten des Vorderkopfes stark eingezogen verengt, daher ist das Epistom auf kurze Strecke parallelseitig, der Vorderrand ist ganz gerade abgeschnitten, die Punktierung ist äusserst fein, nicht sehr eng, gleichmässig. Die Fühler haben wie gewöhnlich eine 5-gliedrige Keule, die stark abgesetzt ist und aus sehr queren Gliedern besteht, das letzte ist viel kleiner als das zehnte, so breit wie lang oder schwach quer, die mittleren Glieder sind winzig klein, perlig, Glied 2 ist viel dicker als 3, dieses ist etwas länger als breit, schwach konisch. Das Endglied der Maxillarpalpen ist lang zylindrisch, die Augen treten unten bis fast unter den Maxillarausschnitt.

Der Halsschild ist vorn ungerandet, viel stärker als der Kopf punktiert, die Punkte sind dicht, im Grunde flach. Die Seiten sind von oben gesehen stark gerundet, von der Seite gesehen fast halbkreisförmig da die Ecken in sehr breitem Bogen verrundet sind.

Die ganz verworrene Punktierung der Flügeldecken ist gröber als die des Halsschildes, nicht gedrängt, etwas rauh, jedes Pünktchen hat ein anliegendes Härchen.

Die Unterseite ist nackt; das Prosternum ist vor den Hüften ausserordentlich kurz, fast kürzer als zwischen den Hüften breit, aber auch dort sehr schmal, es ist in der Längsrichtung stark gewölbt, fällt vorn stark, hinten bis zum Grunde ganz ab und ist im hinteren Absturz gekielt. Die Mittelbrust ist nicht einfach rinnig vertieft, sondern hinten senkrecht eingedrückt, so dass sie ganz tief liegt. Die Hinterbrust ist viel länger als bei den vorhergehenden Arten, viel länger als der Durchmesser einer

Hüfte, ihre Mittellinie ist kräftig gefurcht. Das Abdomen ist ziemlich stark punktiert, die Schenkel sind dünn, die Schienen zur Spitze deutlich etwas dreieckig verbreitert, an den Hintertarsen ist Glied 1 kürzer als 2 und 3 zusammen.

Länge, 2.3 bis 2.6 Millimeter.

Java, Preanger, 4,000 bis 6,000 Fuss (*Dr. O. Warburg*). Ostjava (*Warburg*). Java, Samarang.

Vierzehn Exemplare in den Sammlungen Hamburg, Veth, und Gebien.

Pentaphyllus biconiger, die nächstverwandte Art aus dem asiatischen Gebiet, stimmt mit unserer in dem vorn nicht gerandeten Pronotum, dem leicht behaarten Körper, dem matten Glanz überein, sie unterscheidet sich aber durch kürzeren, breiteren Körper, durch die Prosternalbildung; die Vorderbrust ist zuerst etwas niedergebogen und fällt dann senkrecht, scharf ab, bei unserer Art dagegen ist das Prosternum einfach, ganz heruntergebogen und am Absturz gekielt. Ferner hat *biconiger* beim Männchen auf dem Clypeus zwei kleine, konische Tuberkeln, die bei unserer Art fehlen.

Pentaphyllus oblongus Lewis.

Pentaphyllus oblongus Lewis, Ann. & Mag. Nat. Hist. VI 13 (1894) 398.

Die Art is mir unbekannt geblieben. Die Beschreibung ist leider ungenügend und lässt mancherlei Zweifel; wir erfahren nicht ob die Art nackt oder behaart ist, ob das Männchen einen bewaffneten Kopf hat oder nicht, ob das Pronotum vorn gerandet ist, ausserdem schweigt der Verfasser über die Bildung des Prosternums und die Länge der Hinterbrust. Aber abweichend von allen mir bekannten Arten ist der Fühlerbau, ferner sind die Decken leicht gestreift und der Kopf ist leicht längsgestrichelt.

Japan.

Pentaphyllus spinipes sp. nov. Tafel 1, Fig. 5.

Zylindrisch, hellbraun, lackglänzend.

Männchen, Kopf zwischen den Augen flach, innen, neben ihnen, grubig vertieft, die breite Grube läuft am Auge nach hinten und lässt ihren Innenrand erhaben erscheinen, Stirnhörner fehlen. Die Augen sind länglich, durchaus nicht eingeschnürt, die Stirn ist vorn sehr breit, sie ist sehr fein und nicht eng punktiert. Die ganzen Wangen sind bis vorn zum Epistom sehr stark dreieckig, hornartig aufgebogen, diese Hörner seitlich scharf kom-

press. Die kurzen Fühler haben eine stark abgesetzte Keule von fünf sehr queren Gliedern, auch das letzte ist breiter als lang, Glied 2 ist kaum dicker als 3.

Der Halsschild ist gröber und weitläufiger punktiert als der Kopf, die Punkte sind rund, flach, alle Ecken sind breit verrundet, die Basis ist jederseits flach ausgebuchtet, die Spitze ist nicht deutlich gerandet.

Die Flügeldecken sind verworren punktiert, die Punkte so grob wie die des Halsschildes, Streifen fehlen.

Die Unterseite ist vorn deutlich anliegend behaart; das Prosternum ist zwischen den Hüften schmal, vor ihnen ziemlich lang, es fällt hinten bis zum Grunde senkrecht ab, von der Seite gesehen ist es halbkreisförmig gewölbt. Der Eindruck des Mesosternums ist vorn senkrecht, das Abdomen kräftig und etwas feilenartig punktiert. Die Beine sind kurz, die Schienen verhältnismässig breit, aussen mit scharfer, stacheliger Kante, die besonders an den Vorderschienen sehr deutlich ist; die Stacheln sind dort gleichartig, nicht spitz, borstenförmig, das heisst, parallelseitig, aber klein. Die Hinterseite der Vorderschienen ist gegen das Ende leicht ausgehöhlt, die Aussenrandkante ist also dort, von der Seite gesehen, leicht nach hinten geschwungen.

Länge, 3.2 Millimeter.

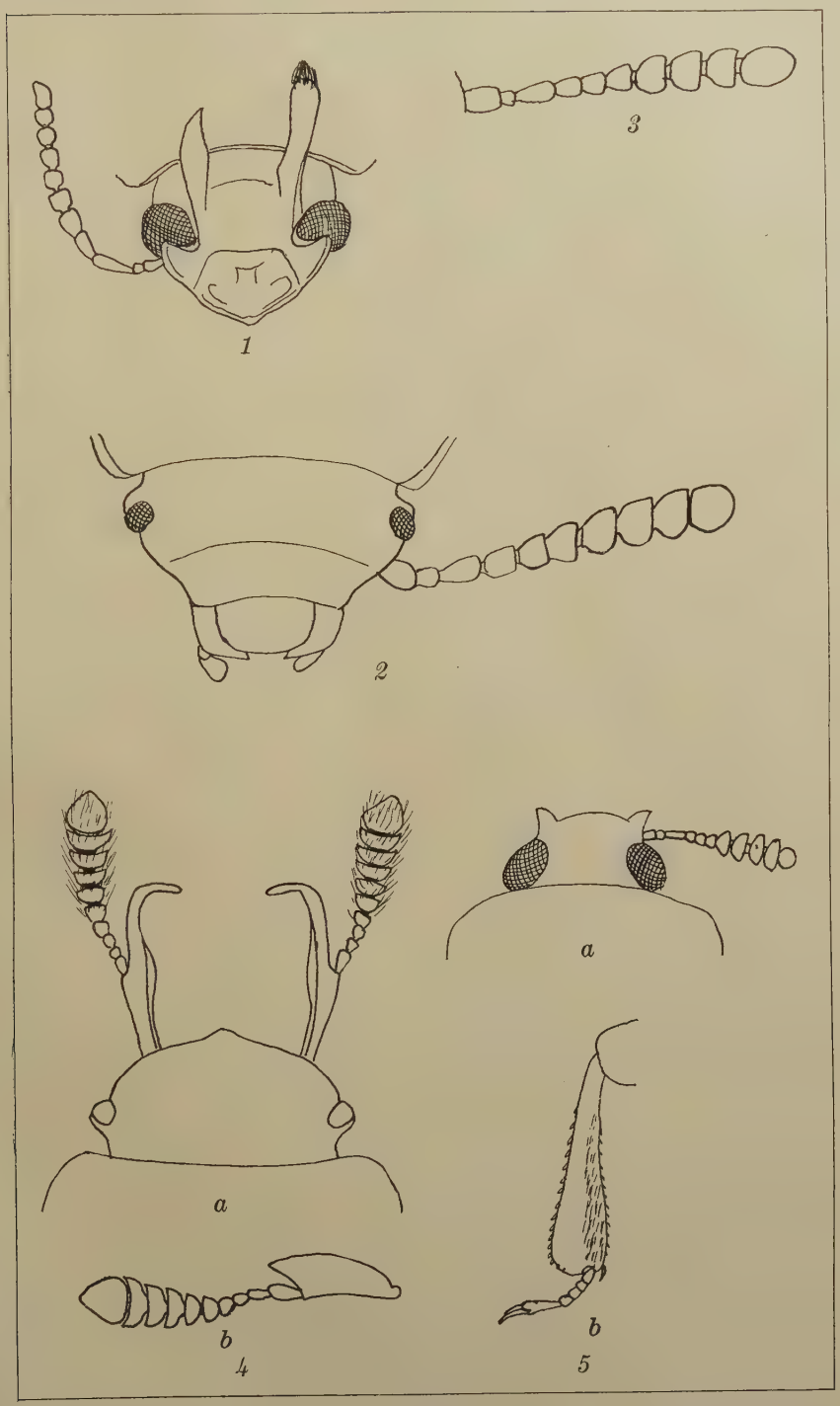
Ein Männchen von den Philippinen, Mindanao (*H. Peters*), in meiner Sammlung, mir von dem Entdecker freundlichst überlassen.

Diese robuste, lackglänzende Art ist durch die Kopfbildung des Männchens von allen andern mir bekannten Arten geschieden. Es ist bei den Arten der Gattung im männlichen Geschlecht entweder der Kopf ganz einfach, nicht ausgezeichnet, oder nur auf der Stirn, oder auf dem Epistom mit Hörnern oder Tuberkeln, bei den asiatischen Arten meist auf der Stirn mit Hörnchen und auf dem Epistom mit Zähnchen. Aber nie sind die ganzen Wangen stark zahnförmig aufgebogen wie bei vorliegender Art. Ueberdies sind die stark stacheligen Schienen auffällig. Im Gegensatz zu den andern nackten, blanken Arten ist unsere vorn am Pronotum nicht deutlich gerandet.

ILLUSTRATION

TAFEL 1

FIG. 1. *Anisocara gynandromorpha* sp. nov. Kopf des Männchens.
2. *Menimus rugicollis* sp. nov.
3. *Menimus ovalis* Allard. Fühler.
4. *Labidocera abnormis* sp. nov. *a*, Kopf des Männchens; *b*, Fühler des Weibchens.
5. *Pentaphyllus spinipes* sp. nov. *a*, Kopf des Männchens; *b*, Vorderbein.



TAFEL 1.

CRICKET-LOCUSTS (GRYLLACRIDÆ), CHIEFLY FROM THE PHILIPPINE ISLANDS

By H. H. KARNY

Of Buitenzorg, Dutch East Indies

TEN PLATES

In this paper are discussed some gryllacrids collected by Prof. C. F. Baker, chiefly in the Philippine Islands. The study thereof proved to be very interesting as most of the Philippine species were known hitherto from only one or a very few specimens. Moreover, our knowledge of the fauna of Luzon, as well as of that of the other Philippine islands, was extremely poor. It was therefore to be expected that comparatively many of these gryllacrids before me should belong to new species or subspecies, as a great part of the material was collected on other islands. I wish to express here my sincerest thanks to Professor Baker, to whose kindness I owe the receipt of this very important material. The types of the new species and subspecies described here are preserved in the Buitenzorg Zoölogical Museum.

This material has shown also some interesting connections between my venational system and the geographical distribution of gryllacrids. When revising the gryllacrids of Buitenzorg Museum [1] I found there only a single specimen of venational type III, originating from Batjan, Moluccas, but none from the Sunda Islands. Now, in the Philippine material before me, about half of all the specimens belong to this type. This fact is worthy of notice, especially as the Moluccas show some zoögeographical relations with the Philippines in other respects also. On the other hand, I know no species of venational type III from the Malaysian region (s. str.).

[1] Treubia 5, Livr. 1–3 (1924) 47–103, 206–234.

VENATIONAL TYPE I [2]

Gryllacris arctatiformis sp. nov.

Gryllacris arctata KARNY (nec Walker), Treubia 5, Livr. 1–3 (1924) 59 (without the literature there cited).

When writing my paper [3] I had only two specimens of this species before me, but none of the true *arctata*. As stated there, I found a slight difference in venation on comparing my specimens with Griffini's figure, but I thought it not sufficient to warrant the establishment of a separate species. In the meantime, I received from Professor Baker three specimens of true *arctata*. It is now clear that there are also differences in the other characters, and the southern species is therefore to be regarded as a new one.

Very similar to *Gryllacris arctata*. General color tawny yellow. Head narrower than in that species, and more obconical in frontal aspect. No ocellar spots visible. Frontal fastigium without dark markings. Fastigium of vertex as wide as first antennal joint, narrower than in *arctata*.

Pronotum (Plate 4, fig. 3) practically as in *arctata* (Plate 4, fig. 4), but the humeral sinus less distinct. All legs longer and slenderer than in *arctata;* especially the fore and middle tibiæ distinctly longer, set with much longer, movable spines (Plate 4, fig. 5). Hind femora incrassate in basal half, about four times as long as wide (Plate 4, fig. 5); in *arctata* scarcely three times as long (Plate 4, fig. 2). Tegmina (Plate 2, fig. 4) a little narrower than in *arctata*. Radial sector arising in the apical third of tegmen. No oblique cross veins between medial and cubital veins (Type I, s. str.); the former simple, the latter three-branched.

Ovipositor slightly curved, practically of the same shape as in *arctata*, but shorter. Female subgenital plate semicircularly rounded (Plate 3, fig. 4); male unknown.

Measurements of Gryllacris arctatiformis sp. nov.

Length.	Female. mm.
Body	16.4–20
Pronotum	3 – 3.4
Tegmina	21.3–21.5
Fore tibiæ	7 – 7.3
Hind femora	11.2–12
Ovipositor	6.5– 7.4

[2] Treubia 5, Livr. 1–3 (1924) 50, 54.
[3] Treubia 5, Livr. 1–3 (1924) 50, 54.

Two females from Mindanao; one from Davao (type), one from Butuan (*Baker*).

Gryllacris arctata Walker.[4]

A little stouter than the preceding species. Ocellar spots distinct, pale yellowish. The two upper ones small, placed at the sides of fastigium of vertices, close to the antennal grooves; the lower one very large, ovate, occupying almost the whole surface of frontal fastigium. This shows in one of the three specimens before me at the sides and above a distinct black margin, as described by Walker; the two others without black markings. Lower margin of front (close to the clypeus) slightly blackish. Fastigium of vertex a little wider than the first antennal joint.

Legs shorter and stouter than in the preceding species; fore and middle tibiæ set with much shorter spines (Plate 4, fig. 6). Venation of tegmina (Plate 2, fig. 3) according to venational type Ia, namely, with an oblique cross vein between medial and cubital veins. Radius with four branches against the fore margin in the distal part. Radial sector arising from radius always in the middle of tegmen, four-branched; sometimes radial vein five-branched and then the sector three-branched only. Medial vein simple; cubital vein always two-branched (simply forked).

Ovipositor slightly curved, longer than in the preceding species. Female subgenital plate (Plate 3, fig. 2) pentagonal, with rather acute lateral angles, distad emarginated at extreme tip. In addition to Griffini's description of male genitalia [5] I give here a figure of male end of abdomen, as seen from behind (Plate 3, fig. 3).

Measurements of Gryllacris arctata Walker.

Length.	Male.	Female.
	mm.	*mm.*
Body	16.5–17	18.5
Pronotum	3.8– 4	3.7
Tegmina	22 –23.5	25.5
Fore tibiæ	5 – 6	5.3
Hind femora	9.2– 9.5	9.4
Ovipositor		9.8

[4] To this species belongs the literature cited in Treubia 5, Livr. 1–3 (1924) 59; see also Hebard, Proc. Acad. Nat. Sci. Philadelphia 74 (1922) 276.

[5] Atti Soc. It. Sci. Nat. 48 (1909) 99.

Three specimens before me; from Mount Maquiling, Luzon, 2 males, and from Los Baños, 1 female (*Baker*).

VENATIONAL TYPE II [6]

Gryllacris pictipes sp. nov.

Allied to *fumigata* De Haan, *nigripennis* Gerstäcker, and *trimaculata* Griffini.

Head pale, tawny yellow, with a slight rosy tinge, especially on occiput and the hind part of genæ. Eyes dark brown. Behind them the lateral margins of occiput are dark blackish infumated. Ocellar spots very small, pale yellow, rather indistinct. Fastigium of vertex not quite twice as wide as first antennal joint. No sulcus between vertex and frontal fastigium. Scrobes of antennæ with black margins. First antennal joint pale, blackish at tip; the following joints shining black until about the middle of pronotum, then gradually becoming brownish. Below eyes at sides of front a sharp, black subocular band. Mandibles and labrum shining black, except extreme tip of latter which is brownish. Palpi yellowish gray; the three distal joints of maxillary palpi linear, scarcely widened distad, smoky gray in distal half. Apical joint of labial palpi strongly widened distad, infundibuliform, obliquely truncate and excavate at the end, smoky gray along median margin of excavation, on both excavated and convex sides.

Pronotum as long as wide, with sharply protruding, linear margins. Fore and hind margins very slightly rounded, the latter almost truncate. Lateral lobes not very high, moderately appressed, with rounded fore and hind angles and a very shallow humeral sinus. Lower margin descending backward. Behind the hind angles a thick, blunt, pale yellowish tooth, directed backward. Anterior transverse sulcus of disk broad and shallow, posterior scarcely any. Longitudinal sulcus distinct, shallow, with a more distinct impression on both ends, reaching from about the beginning of third to the end of fourth fifth of pronotal length. The U-shaped furrow of lateral lobes well impressed, especially with a stronger impression at anterior end. Posterior (descendent) sulcus of lateral lobes distinct. The surface above these furrows strongly arched.

General color of pronotum (Plate 2, figs. 1 and 2) pale yellowish, with a brownish pink tinge on disk. Margins all around

[6] Treubia 5, Livr. 1–3 (1924) 51, 61.

shining black, except in the neighborhood of fore angles of lateral lobes, where they are of the same pale color as the surface. The black color of fore margin produced backward into two blackish spots on fore part of disk separated from one another by a narrow median pink stripe; behind these two spots are two smaller ones on the disk at the place where in *signifera* the widened part of the 7-shaped spot is situated. Median furrow blackish. The arched part above the U-sulcus of lateral lobes also black, and the arched part behind blackish margined but pale in the center. Before the upper fore angle of the large black spot at U-sulcus a minute doubled grayish spot; between the large spot and the dark median sulcus a blackish longitudinal line, confluent with the large spot in the hind part.

Mesopleura and metapleura each with an oblique, dark gray stripe, from base of tegmina and hind wings, respectively, to coxa. All femora yellowish, along undersurface black throughout the whole length; in the distal third or thereabouts shining black as also above and on both sides; before this black area with a slight rosy tinge above. All tibiæ bright yellow with relatively long, black spines, and abruptly shining black at base and apex. All tarsi shining black above, tawny below; last joint and claws black also beneath.

Forewings hyaline in basal half and along fore and hind margin, smoky gray in distal half, but here also some cells hyaline in center. Venation (Plate 3, fig. 1) according to venational type II. Anterior basal cell distad, far overreaching posterior one. Radial vein five- or six-branched; Rs + M four-branched. Median vein arising from base of tegmen as a separate stem, then united with radial vein for a distance of about four cross veins, then separate again to its communication with radial sector. Cubital vein three-branched; the oblique cross vein between medial and cubital veins reaching the latter close behind origin of hind branch; fore branch distad thereof forked again.

Hind wings intermediate between the triangular and cycloid types, dark smoky gray from base to margins. The cells, about three rows along outer margin, dark throughout; the others with obsoletely hyaline centers. Cross veins margined on both sides with a very fine hyaline line; the same is the case with the branches of radial sector and with the spurious length veins near the outer margin. Cross veins before Rs, especially in basal part of wing, without hyaline margins.

Abdomen grayish brown, blackish at apex. Cerci yellow. End of male abdomen (Plate 4, fig. 13) very similar to that of *nigripennis* and its allies, according to type B. Cerci, styles, and margin of subgenital plate set with long bristly hairs.

Measurements of Gryllacris pictipes sp. nov.

Length.	Male. mm.
Body	30
Pronotum	7
Tegmina	37
Hind femora	16.5

One male from Mount Maquiling, Luzon (*Baker*).

This species is well characterized by its long anterior basal cell. In all the specimens of *Gryllacris fumigata* and its subspecies, the venation of which I had the opportunity to study, the anterior basal cell does not overreach the posterior one distad. I have seen no specimen of Griffini's *trimaculata*, and the author says nothing in his description as to venation. If *trimaculata* also possesses a long anterior basal cell, it must be considered, I believe, as a separate species; if these cells are of the same shape as in *fumigata*, it may remain as a subspecies thereof. *Gryllacris pictipes* differs, however, from *trimaculata* by its sharp, dark subocular bands, by the black pictured legs, and by the hyaline margins of cross veins on hind wings. From *fumigata* it may be distinguished, besides the venational characters, especially by the black markings of pronotum.

VENATIONAL TYPE III [7]

Gryllacris plebeia Stål.

Gryllacris plebeia STÅL, Oefv. Vet.-Akad. Förh. (10) 34 (1877) 47; BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien 38 (1888) 334; KIRBY, Syn. Cat. Orth. 2 (1906) 141; GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 91; Boll. Mus. Zool. Anat. Torino No. 668 28 (1913) 7; Ann. Mus. Nat. Hungar. 11 (1913) 304; Philip. Journ. Sci. § D 10 (1915) 65, 70; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 267.

Griffini (1915) gives as the principal characters of the typical form, in describing his var. *immaculata*, the following:

Pronotum maculis duabus parvis anterioribus fuscis ornatum. Spinae tibiarum posticarum basi subtus nigro-fusco cincta. Elytra campo antico-dimidio basali subhyalino, ibique vena unica obliqua distincta.

[7] Treubia 5, Livr. 1–3 (1924) 51, 69.

As to the latter character he says (1909), when describing Stål's type specimen:

> Campo antico in dimidio basali fere haud venato, vitreo, tantum vena obliqua testacea distincta praedito.

I place with this typical form (with some doubt, however) two specimens (1 male, 1 female) of Professor Baker's collection, from northwestern Panay. Each agrees in one character with the typical *plebeia,* the male having the hind tibial spines black throughout and furnished with a black spot on tibia at the spine bases, and the female having blackish spots on the pronotum. The other characters agree in both specimens with Griffini's description of his *immaculata.* Especially as to venation of precostal area, I can find no difference between these two specimens and the specimens of *immaculata* before me. The costal vein is well developed in all the specimens I have seen, testaceous, simple, reaching almost as far as the end of the fore branch of subcosta. Precostal veins two or three, very weak and feeble, nearly hyaline, without cross veins between. If they become still more rudimentary, as they may be in Stål's type, they will be very indistinct; but I do not believe that this will prove to be a character of importance.

The male from northwestern Panay before me has its pronotum quite concolorous, without black markings. It agrees in this character, therefore, with *immaculata.* The venation of tegmina agrees entirely in its chief characters with that of the female from the same locality and with that of *immaculata,* but shows some differences in less valuable characters; it may be, therefore, described and figured here (Plate 9, figs. 1 and 2) as a contribution to our knowledge of the variation of venation in *Gryllacris,* all veins being tawny yellow. Left tegmen: two precostal veins; costa simply forked near base; subcostal vein simple throughout, united near tip with hind branch of costa. Radial sector arising distad from the middle, three-branched; radial vein simple. Then follows a simple longitudinal vein, in the basal part very approximated to the following one and connected with it by some thick cross veins. The following longitudinal vein simply forked at the end of basal third. There can be no doubt that these two longitudinal veins, the simple and the forked, represent together the media which is usually three-branched in this species, but the fore branch here is split off as a separate vein. The following veins simple. Right tegmen: three precostal veins; costa simple; subcosta forked close before tip. Radial

sector arising basad from middle, simply forked; radial vein also simply forked. The following vein (media) two-branched; following ones simple.

Hind tibiæ somewhat infuscated at base above; at each spine base with a black spot; spines themselves also entirely shining black. End of abdomen (Plate 3, fig. 5) very similar to that of *immaculata,* described by Griffini in 1913;[8] but tips of lobes of subgenital plate broadly rounded, more approximated to middle line than to styles; the latter slender, certainly movable, distinctly longer than in *immaculata.* Of the typical *plebeia* the male was not known hitherto. It is therefore not impossible that the blackish spots on pronotum are a female character only, and they may perhaps be wanting in the male. I place this male therefore with the typical *plebeia,* especially because of its black spots on hind tibiæ at the spine bases. It is certainly different from *immaculata,* because of the shape of the subgenital plate and styles.

The female from northwestern Panay agrees very well as to the coloration of pronotum with Griffini's description of Stål's type specimen, which is as follows:

> Color pronoti pallide flavido testaceus, leviter incerte nebulosus. Margines omnes anguste dilute ferruginei; maculae duo parvae nigro-fuscae superne adsunt (una utrinque) sat proximae, parum post sulcum anticum, forma incerta, fere triangulares aequilaterae, marginibus et verticibus dilutioribus, vertice externo postico cum macula dilutiore magis incerta connexo.

The female before me has two black spots on each side of disk, namely, one on each end of the V-shaped furrow of lateral lobes, the posterior one larger but less well defined. The upper margin of V-sulcus nebulosely infuscated; longitudinal furrow of disk also slightly darker.

Venation of both tegmina practically the same, corresponding well with that of *immaculata* (Plate 10, figs. 1 to 3). All longitudinal veins behind radius blackish; two or three precostal veins; costa simple; subcosta simple or simply forked close before end. Radial vein simply forked before apex, the fork somewhat longer than the subcostal one; radial sector arising from radius a little distad from the middle, three-branched. Medial vein two-branched or three-branched, in the latter case the hind branch of chief fork forked again. The following veins simple.

[8] Boll. Mus. Zool. Anat. Torino No. 668 28 (1913) 7, 8.

Spines of hind tibiæ, black at apex, yellowish in basal part, without apposed black spots near their bases. Ovipositor slightly curved, a little shorter than hind femora.

I give here the measurements of the two specimens before me, for comparison with the measurements given by Griffini:

Measurements of Gryllacris plebeia Stål.

Length.	Male.	Female.	Length.	Male.	Female.
	mm.	*mm.*		*mm.*	*mm.*
Body	20	27	Fore femora	8	8
Pronotum	5	5.7	Hind femora	14.8	15
Tegmina	16.5	19.5	Ovipositor	------	13.5

Gryllacris plebeia subsp. immaculata Griffini.

Gryllacris plebeia subsp. *immaculata* GRIFFINI, Boll. Mus. Zool. Anat. Torino No. 668 28 (1913) 7, 8; Philip. Journ. Sci. § D 10 (1915) 65, 70; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 267; GRIFFINI, Mon. Zool. It. No. 2 29 (1918) 28.

Griffini has described this form as a variety only, because he knew no males of the typical *plebeia* and no females of *immaculata*. From the material before me, I cannot doubt that *immaculata* must have subspecific rank at least, if not specific, because of the difference in the shape of the male subgenital plate and styles.

I place with *immaculata* three specimens of the gryllacrids before me; from Los Baños, male (*Baker*), Mount Maquiling, Luzon, female (*Baker*), and Polillo, female (*Taylor*), which agree entirely with Griffini's description. The female from Polillo is stouter than the other specimens; that from Mount Maquiling is small and slender.

Measurements of Gryllacris subsp. immaculata Griffini.

Length.	Male from Los Baños.	Female from Mount Maquiling.	Female from Polillo.
	mm.	*mm.*	*mm.*
Body	20.8	18.3	±25
Pronotum	5.2	4.7	6.1
Tegmina	18.6	15.8	17.8
Fore femora	7.4	6.4	9.2
Hind femora	13.7	12.3	15.5
Ovipositor	------	11	13.3

I have nothing to add to Griffini's detailed description, except as to the venation of the tegmina, which I describe here for the three specimens before me.

Male from Los Baños.—(Plate 10, fig. 1). Of the four precostal veins on right tegmen, the second and third have a short common stem. Costal vein simple, on left tegmen united before tip with fore branch of subcosta, which is simply forked before the end. Radial vein four-branched, a little before origin of first branch (close distad to the middle of tegmen) giving out the radial sector which remains simple on both tegmina (!). Then follows the three-branched medial vein (fore branch simple, hind branch forked again a short space beyond its origin). Following veins simple.

The male genitalia (Plate 3, fig. 6) quite as described by Griffini, differing from those of typical *plebeia* (specimen from northwestern Panay) by the bluntly angulated tips of subgenital lobes which are more widely distant from one another than from the styles, and by the latter being short and broad, almost triangular.

Female from Mount Maquiling.—(Plate 10, fig. 2). With three very weak and feeble precostal veins; both costa and subcosta simple. Radial vein three-branched; basad from first branch, about in the middle of tegmen, arises the radial sector, which is simply forked before the end. Medial vein simply forked before the middle. Following veins simple.

Female from Polillo.—(Plate 10, fig. 3). With three precostal veins; costa simple. Subcostal vein simply forked a little distad from its middle. Radial vein three-branched; radial sector arising in distal third, distad to the fore radial branch, simply forked. Medial vein three-branched, in the same manner as in the male from Los Baños. Following veins simple.

Female genitalia practically as in the typical form, described by Griffini (1909), but the short median lobe perhaps still shorter in *immaculata*. Griffini says of it "leviter rotundato-prominulo, sed in typo subtus retrorsum plicato." These words may perhaps suggest that the retroflection of its tip might possibly be accidental; but I believe it is a constant specific character, as in *brachyptera* and *fuscinervis* (in these two still more distinct), since I find it the same as described by Griffini also in the *plebeia* (female) from Polillo and in the two *immaculata* (females) before me.

Gryllacris plebeia connexa subsp. nov.

One male from Mount Banahao (*Baker*) agrees very well with *immaculata*, differing very slightly by the blackish castaneous labrum and by a somewhat slenderer body; but the venation of both tegmina shows a remarkable difference from the *immaculata* specimens before me and will therefore be described and figured here (Plate 9, figs. 3 and 4).

With three precostal veins, the third forked on right tegmen. Costal vein simple, subcosta simply forked before the end. Radial vein two-branched (left) or three-branched (right). Radial sector arising about in the middle of tegmen, forming a short, oblique cross vein which unites the radial stem with the fore branch of media. This is a character hitherto known only from venational type II; but the reduced venation brings this form into venational type III. The anterior basal cell is here quite half as long as the tegmen, the posterior one entirely wanting. In all the hitherto known species of venational type II, on the contrary, the posterior basal cell also is always present. If this remarkable type of venation should prove to be constant in the specimens from Mount Banahao, they should perhaps be considered as a different species. This united Rs + fore branch of media is three-branched or four-branched. Medial vein itself forked before the union with radial sector; the hind branch remains simple (right) or forked again (left). Following veins simple.

End of male abdomen (Plate 3, fig. 7) very similar to that of *immaculata* and differing by the same characters from the typical *plebeia*. Lobes of subgenital plate, however, somewhat more rounded than in *immaculata;* styles of the same shape, and broadly triangular.

Measurements of Gryllacris plebeia connexa subsp. nov.

Length.	Male. mm.
Body	21.5
Pronotum	5
Tegmina	18.5
Fore femora	7.3
Hind femora	13

Unfortunately, I have only one specimen of this form before me, so that I cannot say whether the described differences are constant or not.

Gryllacris brachyptera Gerstäcker. Plate 1, fig. 3.

Gryllacris brachyptera Gerstäcker, Arch. f. Nat. 26 (1860) 269; Brunner v. Wattenwyl, Verh. zool.-bot. Ges. Wien 38 (1888) 331; Kirby, Syn. Cat. Orth. 2 (1906) 140; Griffini, Ann. Mus. Nat. Hungar. 11 (1913) 296, 304; Philip. Journ. Sci. § D 10 (1915) 65, 70; Bruner, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 267.

I place with this species one female from Tangkulan, Bukidnon Province (*Baker*) which differs very slightly from Griffini's description (1913).

The lateral borders of fastigium verticis seem to be a little more acute than in Griffini's specimen. The black color of all tibiæ does not extend as far as in that species. Extreme base of all tibiæ ferruginous; then follows a broad black ring, ending on upper surface of fore and middle tibiæ, at end of first third of tibial length; remaining part ferruginous. In the hind tibiæ the black color extends a little beyond the middle of tibia. Shape of ovipositor and subgenital plate agrees perfectly with Griffini's description, and the latter I find is especially typical for this species.

As Griffini has given no data as to tegminal venation, I find it necessary to describe and figure it here (Plate 8, figs. 1 to 3). Subcosta simply forked, fore branch united before its tip with end of costal vein on right tegmen. Radial vein simply forked; radial sector three-branched or four-branched, arising basad from fore radial branch. Medial vein three-branched; fore branch remaining simple, on left tegmen entirely split up from hind branch as a separate stem, similarly as in the left tegmen of the *plebeia* male from Panay (see above); hind branch forked again, on left tegmen basad, on the right one distad from the middle of tegmen. Following veins simple.

Measurements of Gryllacris brachyptera Gerstäcker.

Length.	Female. mm.
Body	28.8
Pronotum	6.5
Tegmina	19.5
Fore femora	8.5
Hind femora	15.5
Ovipositor	15

Gryllacris brachyptera brevisector subsp. nov.

Male.—Rufo-testaceous, paler than the typical *brachyptera*, similar in color to *plebeia*, but somewhat larger and stouter than

that species. Mandibles a little darkened at extreme tip, not black. Fastigium of vertex as in the female from Tangkulan. Ocellar spots yellow, small, not very distinct. Margins of clypeus not darkened. Pronotum shaped and sculptured as in the typical form, rufo-testaceous, without darker markings; lateral lobes more yellowish, with a fine dark margin in the neighborhood of hind angle. The dimple on the sides of disk near the hind margin [9] even larger and more distinct than in the female from Tangkulan. Legs yellowish ferruginous; the tibiæ only above and on sides with a black spot below knees, which is somewhat larger in hind tibiæ, here extending about to end of first fifth of their length. Spines of fore and middle tibiæ yellowish, on hind legs blackish, of the same number as in the typical form (Griffini, 1913), those on hind tibiæ with a black spot apposed at their bases. Male genitalia (Plate 3, fig. 8) very similar to those of *plebeia connexa;* subgenital plate with a semicircular blackish spot at base on each side, between them a narrow blackish crossband at extreme base.

Tegmina (Plate 7, figs. 3 and 4) very similar in shape and color to those of the typical form. Radial vein three-branched, radial sector reduced, arising distad to fore radial branch, simply forked. Medial vein three-branched; fore branch simple, on left tegmen separated nearly throughout, on right tegmen twice touching radial stem near its base; hind branch forked again, on left tegmen basad, on right one distad to middle of tegmen. Following veins simple.

Measurements of Gryllacris brachyptera brevisector subsp. nov.

Length.	Male. mm.
Body	22
Pronotum	6.4
Tegmina	20.6
Fore femora	9
Hind femora	15

One male from Tangkulan, Bukidnon Province (*Baker*).

As the male of *brachyptera* is not yet known, I have placed this form with *brachyptera,* where it belongs, following Griffini's key (1915), on account of the black spots of all tibiæ. It seems, however, also to be very near to *plebeia,* especially on account of the less-developed radial sector and the shape of end of abdomen in the male. It is not impossible that it would better

[9] Punctum impressum adest in vertice gibbulae posticae.—GRIFFINI.

be placed as a subspecies to *plebeia,* if the male genitalia of *brachyptera* should show considerable differences. This question cannot be decided at present, and I therefore place the specimen provisionally with *brachyptera* until males of the typical *brachyptera* shall be known.

Gryllacris fuscinervis Stål.

Gryllacris fuscinervis STÅL, Oefv. Vet.-Akad. Förh. (10) 34 (1877) 47; BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien 38 (1888) 334; NAVAS, Bol. Soc. Aragon. 3 (1904) 138 (*scripta*); KIRBY, Syn. Cat. Orth. 2 (1906) 140 (*scripta*), 141; NAVAS, Bol. Soc. Aragon. No. 5 8 (1909) 103 (*scripta*); GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 88; Ann. Mus. Nat. Hungar. 11 (1913) 304; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 267 (*fuscinervis, scripta*); GRIFFINI, Philip. Journ. Sci. § D 10 (1915) 65, 69; Mon. Zool. It. No. 2 29 (1918) 29.

This species belongs in Griffini's key (1915) with the group with "femora tota fulvo-testacea;" but I must place with the species two of the specimens before me in spite of their largely black legs, because the color of the pronotum does not agree with any species of the group with "genicula atrata, seu femorum apex et basis tibiarum atrata." This is in accordance with the fact that Griffini has in the meantime described a new variety of *fuscinervis,*[10] characterized by its "pedibus totis atris, excepto apice tibiarum cum tarsis fulvo et coxis ferrugineis." The typical *fuscinervis* was originally from Mindanao (type of Navas's *scripta,* whereas Stål has given for his type only the locality "Philippines"), the var. *diamantii* from Basilan, southwest of Mindanao. The two specimens before me seem to be about intermediate between *diamantii* and the typical *fuscinervis,* and were collected in northwestern Panay (*Baker*). I name them therefore:

Gryllacris fuscinervis panayensis var. nov. Plate 1, fig. 7.

Differing from the typical *fuscinervis* by the coloration and the somewhat larger size. All other characters as in *fuscinervis.* Ovipositor and female subgenital plate practically as in *brachyptera* ("genitalia ♀ ut in speciebus proximis" Griffini, 1918). Male subgenital plate and styles not visible in the specimen before me, because the end of abdomen is here mutilated, ninth tergite of male quite as described by Griffini (1909).

[10] Var. *diamantii* Griffini, Mon. Zool. It. No. 2 29 (1918) 29.

Measurements of Gryllacris fuscinervis panayensis var. nov.

Length.	Male.	Female.	Length.	Male.	Female.
	mm.	*mm.*		*mm.*	*mm.*
Body	25.5	28	Fore femora	7	8.5
Pronotum	5.4	6.2	Hind femora	13.2	16.3
Tegmina	17	21	Ovipositor	--------	15

Much darker than the typical form. Head blackish, occiput and clypeus paler, brown. Ocellar spots and the short stripes beneath them as in the typical form. Forehead entirely black in female, with a median longitudinal pale brownish stripe below inferior ocellar spot in male. Labrum darkened, especially along margins, mandibles blackish at tip. Pronotum with a large crescent-shaped, yellowish brown spot above fore angle of lateral lobes; otherwise entirely blackish. All femora brownish in basal part, black in distal half or third. All tibiæ black or blackish brown above, paler brown below. Tarsi brown, somewhat darkened above. Spines of fore and middle tibiæ entirely yellowish brown, those of hind legs black.

Venation of tegmina (Plate 6, figs. 1 and 2) similar to that in the preceding species, according to venational type III. With two or three precostal veins, very weak and feeble, pale, nearly hyaline; cross veins between them and between costal and subcostal veins of the same color. Both these darker, brown, simple, or the subcosta simply forked before apex. Radial vein two-branched or three-branched. Radial sector somewhat reduced, three-branched, arising in the male before me (on both sides) distad to first radial anterior branch, in the female basad from it on left tegmen, entirely wanting on the right one. Medial vein three-branched, as in the other species of venational type III here described, the anterior branch sometimes separated (female, left; male, right tegmen; in the latter united for some distance near base with radial stem). The anterior medial branch in right tegmen of the female before me, where the radial sector is wanting, three-branched before apex. It is certainly an anomalous development of this branch, being in connection with the reduction of radial sector; nevertheless, there is no oblique cross vein between radius and media, which could otherwise represent the base of radial sector. Following veins simple.

One male and 1 female from northwestern Panay (*Baker*) of which the female may be considered as the type of this variety; the female is somewhat darker than the male.

Gryllacris nigrogeniculata Brunner v. Wattenwyl. Plate 1, fig. 5.

Gryllacris nigrogeniculata BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien 38 (1888) 330; KIRBY, Syn. Cat. Orth. 2 (1906) 140 (*punctifrons*, partim); GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 96; Ann. Mus. Nat. Hungar. 11 (1913) 303; Philip. Journ. Sci. § D 10 (1915) 65, 69; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 267.

As there exists no description of this species other than the short one by Brunner, I must give some additional notes from the female before me. General appearance very similar to that of *plebeia* and *brachyptera*, quite different from *punctifrons*, as already stated by Griffini. Kirby's synonymy is, therefore, erroneous.

The black color of vertex forms an acute triangle on upper part of fastigium when seen from in front. Remaining part of anterior surface of fastigium testaceous. Suture between vertex and frontal fastigium distinct. Upper surface of head with occiput black throughout. Anterior surface of first and second antennal joints black; the following two or three joints entirely blackish, the others brown. Margins of antennal scrobes very finely blackish bordered, with a larger blackish spot at their inner, lower angle, produced into a blackish, hooklike stripe as far as the place where in *punctifrons* and *sexpunctata* the two lower black dots are situated. Furthermore, four other dots are also present, namely, one on each side of forehead, and two on upper part of clypeus. Eyes beneath and behind broadly blackish bordered. Genæ testaceous, subocular furrow visible in lower part only, broad and shallow. Clypeus smoky bordered. Mandibles and labrum blackish in distal part. Apical joint of palpi slightly thickened distad, that of labial palpi obliquely truncate at tip.

Shape and sculpture of pronotum similar to those of *plebeia* and *brachyptera*, not very distinct. Margins darkened for their entire extent. From anterior margin on each side of disk a large black spot, produced backward. Longitudinal sulcus blackish, in the shape of an arrowlike line. Posterior (ascending) branch of the V-shaped sulcus of lateral lobes black. Of the same color also is the dotlike dimple on sides of disk near hind margin, but smaller and less impressed than in *brachyptera brevisector*.

All veins of tegmina (Plate 6, figs. 3 and 4) (also the precostal ones!) dark rufocastaneous. Three precostal veins; costa and subcosta simple. Radial vein three-branched; sector reduced,

arising far distad of middle and a little distad of first anterior branch, two-branched or three-branched. Medial vein at base running close behind radial stem but not united with it, forked before middle; anterior branch remaining simple, hind branch united with fore branch of cubital vein; this $M_2 + Cu_1$ simply forked, on right tegmen moreover with a short accessory branch before the fork. Hind branch of cubital vein simple. Anals simple, except the last two which arise from a relatively long common shaft. Venation of hind wings very similar to that of *brachyptera* (Plate 8, figs. 1 to 3), but radial vein and sector each four-branched (in *brachyptera* the former three-branched, the latter five-branched); first branch of radial sector arising close before middle (less basad than in *brachyptera*).

Legs as described by Brunner. Spines of hind femora pale at base, seventeen on inner, nine on outer edge. Ovipositor slightly curved, slender, less narrowed in distal part than in *plebeia* and *brachyptera,* obliquely truncate above at tip. Female subgenital plate with a short, basad-directed tooth at extreme base; hind margin obtusangulately triangular.

One female from Polillo (*Taylor*).

I place with this species also one male from Mount Maquiling, Luzon (*Baker*), although it does not quite agree with Brunner's description, having the lobes of ninth tergite furnished with sharp spines crossed with one another (Plate 4, fig. 12), whereas Brunner says: "lobis rotundatis, muticis." I must suppose that these spines were overlooked by Brunner or broken off in his type specimen. All other characters accord with Brunner's description and with the female here described.

Occiput with a large V-shaped tawny yellow marking. The two anterior black spots of pronotum not confluent with the broadly black fore margin (as in the female from Polillo), but distinctly separated therefrom by tawny yellow. Legs as in female; hind femora with eight spines on outer, thirteen to fifteen on inner edge. Tegminal venation (Plate 6, figs. 3 and 4) practically as in female. Radial sector very short, simple? (both tegmina being mutilated at extreme tip). Medial vein arising from base as a separate stem close to the radial one, then united with this for a distance of about three or four cross veins (on both tegmina!), then separated again; before the middle branched into a simple anterior branch or simply forked just before apex and an oblique cross vein uniting with the fore branch of cubitus. This $M_2 + Cu_1$ simply forked on both teg-

mina just distad of their juncture, hind branch of cubital vein simple. Anals as in female.

Measurements of Gryllacris nigrogeniculata Brunner v. Wattenwyl.

Length.	Mount Maquiling male.	Polillo female.	Length.	Mount Maquiling male.	Polillo female.
	mm.	*mm.*		*mm.*	*mm.*
Body	25	25.4	Fore femora	8.7	9
Pronotum	6	6.2	Hind femora	15.7	15.7
Tegmina	±20	20.4	Ovipositor	--------	12.3

Gryllacris nigrogeniculata tristis subsp. nov.

Very similar in size and general appearance to the typical *nigrogeniculata,* but widely different from it at first view by the large extension of black color.

Head shining black, except clypeus, palpi, and labrum which are tawny yellow, clypeus somewhat darker, brownish. Inferior ocellar spot small, well defined, elongate, yellowish, the upper ones not visible. Antennæ black in basal part, then gradually becoming fuscous. Pronotum tawny yellowish, black all around, the black color at the fore and hind margins somewhat produced on disk; otherwise no black markings.

Tegmina shining black, with black veins, yellowish hyaline in precostal and costal area, grayish in distal half along margins. In the paler parts of tegmen the veins also are black and narrowly bordered with black. Venation (Plate 7, figs. 1 and 2) similar to that of the typical form. The radial sector arising on left tegmen before first radial fore branch, on right tegmen entirely wanting. Medial vein on left tegmen simply forked a little basad of middle; on right tegmen both branches of chief fork forked again, the anterior branch somewhat before apex, the hind one near its base. Following veins simple. Hind wings cycloid, gray, with deeply black veins. Venation quite as in the typical form.

Femora as in the typical form; spines of hind femora black, with apposed black spots at their bases. All tibiæ shining black throughout; spines also black, with yellowish tips on fore and middle tibiæ. First tarsal joint black above, undersurface and the other joints tawny. Ovipositor of similar size and shape as in the typical form, but gradually narrowed to the acute tip, not obliquely truncate at apex. Female subgenital plate somewhat mutilated in the specimen before me; the shape seems, however, to be similar to that of the typical form.

Measurements of Gryllacris nigrogeniculata tristis subsp. nov.

Length.	Female. mm.
Body	21
Pronotum	5.5
Tegmina	18.4
Fore femora	8
Hind femora	14.2
Ovipositor	11.5

One female from Samar (*Baker*).

Gryllacris siderea sp. nov. Plate 1, fig. 2.

This name may be derived from the Greek σίδζος=iron, steel, because of its beautiful steel blue color; or from the Latin *sidera* =stars, because of its metallic splendor and of the coloration of the hind wings—like a starry sky—similar to that of the New Guinean *urania*.

A very small species. General color steel blue, antennæ and all legs bright orange yellow. Abdomen reddish brown, with a faint steel blue gleam.

Occiput and vertex strongly arched, steel blue. Fastigium verticis, when seen from in front, more than one and a half times as wide as first antennal joint, with protruding lateral margins below upper ocellar spots. Suture between vertex and frontal fastigium not discernible. Ocellar spots yellowish brown, the upper ones distinct, the lower ones larger, but not well defined. Genæ dark, with a slight metallic hue; subocular furrows broad and shallow, in the upper part very indistinct. Forehead reddish castaneous with a blackish band along clypeal margin and two dark longitudinal bands from inner lower angle of antennal scrobes to clypeal margin, the bands not well defined, nebulose. Mouth parts of usual shape, brown. Palpi brownish yellow. Apical joint of maxillary palpi linear, very slightly thickened distad; that of labial palpi very much enlarged, almost infundibuliform, obliquely truncate at end.

Pronotum slightly wider than long, entirely steel blue. Sculpture of the usual arrangement, but very slightly developed; the U-shaped sulcus of lateral lobes only sharp and deeply impressed. Margins of pronotum linear, protruding. Lateral lobes little appressed, much longer than high, with backward-descending lower margin; angles bluntly rounded. No humeral sinus. Hind margin of disk truncate. Above hind angle of lateral lobes an acute, thick, posteriorly directed, yellowish spine.

Sterna orange yellow; prosternum unarmed; mesosternal and metasternal lobes produced in a stout downward-directed spine.

All legs short and stout, uniformly orange yellow. Spines of fore and middle tibiæ unicolorous, yellowish, hardly longer than in *Gryllacris arctata* (Plate 4, fig. 6). Hind femora (Plate 4, fig. 7) extraordinarily wide and relatively short, below with about twelve short spines on each margin. Hind tibiæ slightly curved, above with seven spines on each margin, which are considerably longer than those of femora. All these spines of the hind legs with darker tips.

Tegmina uniformly steel blue. Venation somewhat reduced. One precostal vein; costal and subcostal vein simple, the area between them not wider than that between subcosta and radius. Radial vein simple; radial sector arising close behind middle, simply forked at apex. Medial vein simply forked about at end of first third. Following veins simple.

Hind wings cycloid, dark brown, nearly black. All cross veins, except those along the margins, surrounded by large, orange yellow spots; more than thirty such spots present on one wing. By this coloration, *siderea* reminds one of the New Guinean *urania*, but the orange spots are more numerous and relatively larger than in *urania*.

Eighth tergite a little longer than the preceding ones. Ninth tergite (Plate 4, fig. 8) large, arched, with a rectangular, concave impression in basal part (natural or perhaps a post-mortem deformation?); lower margin covered by the large subgenital plate, so that it is not possible to state with certainty whether there are long, crossed, almost horizontal spines present; but it seems that there are such (type A). Cerci moderately long, bristle-haired. Subgenital plate (Plate 4, fig. 9) extraordinarily large, transversely rectangular in basal part, then of the shape of a large, acutangular triangle, bluntly rounded at apex. Ventral surface with a fine longitudinal furrow and an obtusangulate cross sulcus. Styles short and very weak, inserted at base of triangular part of subgenital plate. Female unknown.

Measurements of Gryllacris siderea sp. nov.

Length.	Male. mm.
Body	16.5
Pronotum	4.7
Tegmina	12.3
Fore femora	5
Hind femora	8
Ninth tergite	1.7

One male from Butuan, Mindanao (*Baker*).

A very characteristic species, well distinguished from all others by its beautiful color and the remarkable shape of end of abdomen in the male. Its small size reminds one of the species of the *punctifrons* group.

VENATIONAL TYPE Vb [11]

When I first defined my five venational types [12] I knew of type V only species with very reduced, simple venation, like *navicula* and *fasciata*,[13] corresponding with Walker's genus *Larnaca*. Later I found in some species of this type [14] a venation differing from type IV by progressive reduction only, whereas the other characters were the same as in type IV, namely, medial vein united in basal part with radial stem. I named this venation "Va," in contrast with "Vb" in which the media arises from the cubital stem.[15] At that time [16] I thought it not impossible that Vb might perhaps be nothing more than a mere variety of Va, and this opinion was supported by the variability of *G. willemsei*.[17] At the present time, however, I believe such cases represent rare exceptions. In by far the most examples I found types Va and Vb rather constant and well differentiated from each other, especially in *pallidula* (Va) and *inconspicua* (Vb) and some similar species which I have before me in extensive material from Java, Buru, and the Key Islands. This material will be published in future papers in Treubia. For the present I will state only that most of the species of type Vb are not to be derived (in a phylogenetical sense) from Va but, I think, rather from III. *Gryllacris leefmansi* Karny shows very clearly the manner in which this evolution may have occurred. Here [18] the cubital vein is very closely approximated, in the basal part, to the medial stem, and it is easily conceivable that they may be quite united in a more-recent stage of evolution. This consideration is the reason why I place here Vb after III, not after IV. However, it will be

[11] Treubia 5, Livr. 1–3 (1924) 52, 100.
[12] Schultze, L. Zool. Anthrop. Ergebn. Südafrika No. 1 4 (1910) 38.
[13] Treubia 5 (1924) 103, fig. 35.
[14] Treubia 5 (1924) 101, fig. 33, *pallidula*.
[15] Treubia 5 (1924) 102, fig. 34, *inconspicua*.
[16] Treubia 5 (1924) 100; Zool. Mededeel. 5 (1920) 151.
[17] Treubia 5 (1924) 230, fig. 85.
[18] Treubia 5 (1924) 70, fig. 28.

a problem for further study to distinguish such species of type Vb as have originated from III from those originating from Va (like *willemsei*).

Gryllacris recticauda sp. nov. Plate 1, fig. 6.

Female.—General color dark yellowish brown. The greater part of head and of all tibiæ black. Ovipositor very dark blackish brown.

Head somewhat wider than pronotum; ovate, somewhat elongate, when seen from in front. Occiput and vertex strongly convex; fastigium of vertex, when seen from in front, somewhat wider than first antennal joint, with bluntly rounded lateral margins. Forehead shining, with fine impressed dots and with one larger dot below on each side; in the neighborhood of clypeus depressed, almost concave. Subocular furrows visible only in lower part as a broad triangular impression. Mouth parts of the usual shape. Apical joint of maxillary palpi distad a little widened, that of labial palpi somewhat more widened and obliquely truncate at end.

Occiput and genæ tawny brown. Vertex, eyes, and entire forehead black. Ocellar spots present, distinct, yellow, the upper ones narrow, ovate, the lower one larger, more than half as wide as the frontal fastigium, orbicular, well defined. No other pale spots or stripes between the ocellar ones. Antennal scrobes pale, tawny. First antennal joint and basal half of second one black; remaining ones tawny ferruginous. Mouth parts yellowish brown, apical joints of all palpi somewhat darkened at extreme tip.

Pronotum unicolorous, tawny brown, without any blackish longitudinal band on disk, with linear, protruding, somewhat darker ferruginous margins; half cylindrical in shape, when seen from above; somewhat longer than wide. Anterior margin slightly rounded, a little thickened; anterior cross furrow distinct, impressed. Longitudinal sulcus very shallow, forming two elongate dimples, one about in the middle of disk, the other farther behind. Hind cross furrow very indistinct, somewhat visible on sides, in the middle nearly absent. Hind margin slightly rounded, almost truncate. Lateral lobes much longer than high, little appressed; fore and hind angles rounded; lower margin straight, somewhat descending backward. No humeral sinus. The V-shaped sulcus and the oblique posterior one distinct, impressed. Space between them arched, on that above

the posterior sulcus a little impressed dimple, similar to that in *nigrogeniculata* and *brachyptera.*

Tegmina (Plate 2, fig. 5) short, not reaching to end of abdomen. General color tawny yellowish in basal half, grayish hyaline distad; veins testaceous, a little darkened apically. With about four precostal veins; costa and subcosta simple. Radial vein simple on left, simply forked on right tegmen. Radial sector arising somewhat distad of middle, on left tegmen forked, both branches forked again, on right tegmen three-branched. Medial and cubital veins arising from a short common stem; on left tegmen each of them simply forked; on right tegmen media three-branched (anterior branch simple, hind branch forked again), cubitus simple. Anals simple. Hind wings cycloid, grayish hyaline, with darker veins.

Legs moderately stout, haired. All femora tawny throughout. Fore and middle tibiæ black in basal part, yellowish brown in distal, the black color reaching to middle on undersurface to beginning of apical fourth on upper surface. All spines yellowish. Hind femora on outer margin with nine, on inner with fifteen spines, which are blackish at apex. Hind tibiæ with seven spines on each side; black from knee to last spine, remaining apical part tawny; spines black at base and at apex, brownish in their middle. All tarsi tawny brown.

Abdomen dark brown. Cerci relatively short. Ovipositor straight throughout, narrow, gradually narrowing from base to tip, subacute at apex. Female subgenital plate with basad reflexed hind margin, similar to that in *fuscinervis* and *brachyptera;* but, besides the rounded median lobe, there is on each side a more projecting, subacute, toothlike lateral lobe.

Measurements of Gryllacris recticauda sp. nov.

Length.	Female. mm.
Body	26.5
Pronotum	5.2
Tegmina	15
Fore femora	7
Hind femora	13.7
Ovipositor	13.3

One female from Kolambugan, Mindanao (*Baker*).

This new species comes close to *fuscinervis,* in Griffini's key (1915), but differs from it by the color of head and pronotum, the tegminal venation, the straight ovipositor and the shape of the female subgenital plate.

Key to the species allied with Gryllacris punctifrons Stål.

a^1. Tegmina about one-fourth longer than hind femora, their veins dark. Vertex without darker markings. Spines of hind femora black. (Ceram, Moluccas.) ..... G. sexpunctata Brunner v. Wattenwyl.

a^2. Tegminal veins pale, tawny.

b^1. Pronotum with well-defined black markings. Vertex with a blackish spot.

c^1. Occiput and all tibiæ unicolorous, testaceous. (Batjan, Moluccas.) G. leefmansi Karny.

c^2. Occiput with a large V-shaped blackish marking. All tibiæ above with a blackish annuliform spot near base. (Mindanao, Philippines.) ..... G. melanosticta sp. nov.

b^2. Pronotum concolorous, tawny brown, sometimes a little nebulous, never with sharp, black markings.

c^1. Hind tibiæ black in basal half. (Samar, Philippines.) G. samarita sp. nov.

c^2. Hind tibiæ tawny, their spines somewhat darker brown, black at apex.

d^1. Tegmina reaching to end of abdomen. Northwestern Panay, Philippines.) ..... G. modesta sp. nov.

d^2. Tegmina distinctly shorter, not reaching end of abdomen. Females only known.

e^1. Female subgenital plate almost square, with thickened lateral margins. (Barrio de Biting, Philippines.) G. punctifrons Stål.

e^2. Lateral margins of female subgenital plate converging backward, not conspicuously thickened.

f^1. Female subgenital plate transverse, with broadly obtusangulately emarginated hind margin. (Negros, Philippines.) G. emarginata sp. nov.

f^2. Female subgenital plate acutely triangular, pointed at tip.

g^1. Vertex dark spotted. Radial vein simple, without any sector. Female subgenital plate finely black margined. (Mount Maquiling, Luzon, Philippines.) G. privata sp. nov.

g^2. Vertex concolorous, tawny. Radial sector arising about in the middle of tegmen from radial vein. Female subgenital plate not darker bordered. (Polillo, Philippines.) ..... G. sectoralis sp. nov.

Gryllacris melanosticta sp. nov.

Male.—Differing from *punctifrons* Stål by the following characters: Occiput infuscated at extreme base, in anterior part furnished with a large, blackish, V-shaped stripe. Vertex with a blackish, anteriorly bifid spot. Besides the six blackish dots described for *punctifrons*, there are four other, smaller ones, forming with the two lower of the six dots a subregular hexagon: one on each side of lower part of front and two in upper part of clypeus. The first three antennal joints blackish at base.

Pronotum with blackish markings: one arrow-shaped at the longitudinal sulcus, one on each side of fore part of disk at the place where in *signifera* the widened part of the 7-shaped spot is situated; one at the inferior angle of V-shaped sulcus of lateral lobes, and one or two in the hind discal dimple, as in *nigrogeniculata*. Hind wings hyaline, without a rosy tinge. On all tibiæ below the knees a small blackish spot on upper surface. Hind femora on outer margin with seven spines; those on inner margin more numerous, but very small. Spines of hind tibiæ, six on each side, black, with apposed black spots at their bases.

Tegmina (Plate 5, figs. 1 and 2) pale yellowish, veins testaceous, a very little darker brown in distal part. Four precostal veins, on right tegmen the last one united at base with costa; this and subcosta simple. Radial vein simple; sector arising somewhat distad of middle, simply forked. Medial and cubital veins united in basal part to a common stem; media simply forked before apex, cubitus before middle of tegmen. Anals simple.

Eighth tergite produced, more than twice as long as seventh. Ninth tergite also produced, a little shorter than the preceding one, cucullate, arched, with a median impression in lower (distal) part, and on each side of it somewhat globosely inflated; at apical margin with two dark, short, blunt, crossed spines. Cerci moderately long. Subgenital plate (Plate 3, fig. 9) short and wide, bluntly excised at apical margin, with obtusangulate lobes; on each side furnished with a slender style.

Measurements of Gryllacris melanosticta sp. nov.

Length.	Male. mm.
Body	17
Pronotum	4
Tegmina	13.3
Fore femora	4.7
Hind femora	9.2

One male from Kolambugan, Mindanao (*Baker*).

Gryllacris samarita sp. nov.

Male.—Differing from *punctifrons* by the following characters: Occiput and vertex tawny brown, concolorous, without darker markings. Besides the typical six black dots, there are also the two lower frontal dots, as in *melanosticta*, but those on clypeus not visible. Labrum darker, brown, almost black at apex. Antennæ concolorus. Pronotum unicolorous tawny,

without black markings, indistinctly nebulous on disk. Anterior cross furrow throughout (even in middle part) more distinct than posterior. Hind wings hyaline, with dark brown veins. Spines of fore and middle tibiæ rather long. Spines of hind femora black, with apposed black spots at their bases; on outer margin six or seven, on inner, eight. Hind tibiæ shining black in basal half, tawny yellow in apical part; spines black in the black part, brownish with darker tips in the yellowish part.

Tegmina (Plate 5, fig. 3) yellowish, veins tawny yellow. Venation reduced, as in *fasciata* Walker. Two precostals; costa, subcosta, radius, and radial sector simple, the latter arising on left tegmen in apical part, on right tegmen before middle. Medial vein three-branched on left tegmen (anterior branch remaining simple, hind branch forked again), simply forked on right tegmen. Cubital vein simple, united with media at extreme base to a common stem. Then follow eight simple anals.

Eighth tergite comparatively shorter than in the preceding species. Ninth tergite of a similar shape as in that species, but with a deep and broad longitudinal furrow; at distal margin, I cannot distinguish any spines. Subgenital plate (Plate 3, fig. 10) of a shape similar to that of *melanosticta*, but the emargination more rounded; styles inserted at the tips of the lobes.

Measurements of Gryllacris samarita sp. nov.

Length.	Male. mm.
Body	17.8
Pronotum	4.5
Tegmina	12.2
Fore femora	5.7
Hind femora	10.7

One male from Samar (*Baker*).

Gryllacris modesta sp. nov.

Male.—Differs from *punctifrons* by the following characters: Vertex with an indistinct, nebulous, dark brown spot above. Occiput concolorous. The six dots on forehead as in *punctifrons*, the others, the lower ones (present in both preceding species), not visible. Labrum dark brown except at base, where it is yellowish. Pronotum vaguely nebulous, not distinctly infuscate in the middle. Tegmina practically as in the preceding species (Plate 5, fig. 3): two precostals, the second one on right tegmen, united at base with costal vein. Radial sector simple, arising from radius much more basad than in the preceding species, about at end of first fourth; radial vein simple on right tegmen,

simply forked before apex on left tegmen. Media simply forked, on right tegmen before middle, on left tegmen close before apex. Cubital vein simple, united at base with medial stem. Anals eight, simple. Hind wings cycloid, hyaline. Spines of fore and middle tibiæ relatively long. Spines of hind legs blackish at apex, without darker spots apposed to their bases; on hind femora six or seven spines on each margin; on hind tibiæ six on outer edge, five on inner. Ninth tergite of male with a large triangular impression in basal half; apical margin rounded, slightly emarginate in middle. Male subgenital plate (Plate 3, fig. 11) longer and narrower than in both preceding species, semicircularly emarginated at apex, with slender styles inserted at tip of lobes.

Measurements of Gryllacris modesta sp. nov.

Length.	Male. mm.
Body	18.7
Pronotum	4.3
Tegmina	13.4
Fore femora	6
Hind femora	10.3

One male from northwestern Panay (*Baker*).

Gryllacris emarginata sp. nov.

Female.—Differing from *punctifrons* by the following characters: Occiput and vertex indistinctly darker nebulous. Besides the six typical spots on forehead, two lower ones are also present, as in *samarita,* clypeal ones wanting. Labrum and mandibles somewhat darkened along the margins. Pronotum concolorous, not infuscate on disk. Tegmina not reaching to end of abdomen, otherwise practically as in both preceding species. Radius and its sector simple, the latter arising on both tegmina basad of middle, on right tegmen united again with radial vein for a short distance. Medial and cubital veins united at extreme base to a common stem, the former on left tegmen simple, on right tegmen simply forked before middle; cubitus simple on right tegmen, simply forked a very little distad of middle on left tegmen. Anals eight, simple. Legs as in the preceding species. Spines of hind femora, six or seven on outer margin, twelve to fourteen on inner; number on tibiæ as in *modesta.* Ovipositor as described by Griffini (1909) for *punctifrons.* Female subgenital plate (Plate 3, fig. 12) trapezoidal, wider than long, obtusangulately emarginated at apical margin, with bluntly rounded lobes.

Measurements of Gryllacris emarginata sp. nov.

Length.	Male. mm.
Body	23.3
Pronotum	4.7
Tegmina	13
Fore femora	7
Hind femora	12.8
Ovipositor	13.4

One female from Cuernos Mountains, Oriental Negros (*Baker*).

This species, by the shape of the female subgenital plate, comes nearest to Stål's type specimen of *punctifrons*, as described by Griffini, 1909 ("Lamina subgenitalis ♀ verisimiliter subquadrata, pubescens, lateribus externis crassiusculis"). It does not, however, quite agree with this description in the details of structure, so that I think it must be separated as a different species. Later (1913, 1918) Griffini described under the same name some *Gryllacris* specimens from Luzon having the female subgenital plate triangular, acutely pointed at tip. He was mistaken in his earlier statement (1909) that "apex abdominis in typo est laesus;" therefore, he thought later that his original description of Stål's type was not accurate. As I now see that there are valuable differences in the shape of subgenital plates in specimens from different islands, I cannot agree therewith and, on account of this character, I believe that Stål's species is different from the Luzon specimens. The latter very probably belong to the following species, if not perhaps to *sectoralis;* this point cannot be decided with certainty, as Griffini says nothing of the tegminal venation of his specimens. Stål's specimen came from "Philippinae, Barrio de Biting;" unfortunately, I cannot find on my maps any place of this name.

Gryllacris privata sp. nov.

Gryllacris privata ? GRIFFINI, Boll. Mus. Zool. Anat. Torino, No. 668 28 (1913) 6 (*punctifrons*, nec Stål); Mon. Zool. It. No. 2 29 (1918) 32 (*punctifrons*, nec Stål).

Female.—Differing from *punctifrons* by the following characters: Occiput concolorous. Vertex with an irregular dark spot above. Eight spots on forehead, as in *emarginata* and *samarita*. Labrum dark along margins, except the basal one where it is pale. Pronotum concolorous, not infuscated. Tegmina short, yellowish, similar as in *samarita* (Plate 5, fig. 3), but without

any radial sector. With one or two precostals; following veins simple. Media simply forked before middle, united at base with the simple cubitus. Anals seven, simple. Legs as in the preceding species, but on inner margin of hind femora eight spines only. Ovipositor practically as in the preceding species. Female subgenital plate (Plate 3, fig. 13) triangular, acutely pointed in apical half, with fine dark margins.

Measurements of Gryllacris privata sp. nov.

Length.	Female. mm.
Body	19.5
Pronotum	4.7
Tegmina	11.3
Fore femora	5.8
Hind femora	10.4
Ovipositor	11

One female from Mount Maquiling, Luzon (*Baker*).

By the shape of female subgenital plate very near to the following species, but differing from it by tegminal venation.

Gryllacris sectoralis sp. nov.

Female.—Differing from *punctifrons* by the following characters: Occiput and vertex concolorous. Blackish dots on forehead as in the preceding species; besides the six typical ones also two lower, frontal dots. Labrum concolorous, pale throughout. Pronotum concolorous, not darkened. Tegmina short, yellowish. Two precostals, on right tegmen arising from a short common stem. Costa and subcosta simple. Radial vein simple on right tegmen, simply forked in apical part on left tegmen. Radial sector on both tegmina present, simple, on left tegmen arising before middle; on right tegmen behind middle of tegmen, united for a short distance, about in middle of sector, with medial anterior branch. Media simple on left tegmen, simply forked distad of middle on right tegmen, united at base with the simple cubitus; this common stem, M + Cu, longer on left than on right tegmen. Anals seven, simple. Hind wings cycloid, grayish hyaline. Legs as in the preceding species; hind femora on outer margin with five spines in distal half only, unarmed in basal half; on inner margin with eight to ten spines. Ovipositor and female subgenital plate (Plate 3, fig. 14) practically as in *privata*, but subgenital plate without dark margins in *sectoralis* and a little slenderer and more strongly produced distad than in *privata*.

Measurements of Gryllacris sectoralis sp. nov.

Length.	Female. mm.
Body	18.2
Pronotum	4.7
Tegmina	11.3
Fore femora	6
Hind femora	11.5
Ovipositor	11

One female from Polillo (*Taylor*).

Very near to the preceding species; if further material should show that the difference in the tegminal venation is not constant, I should prefer then to consider *sectoralis* as a subspecies or variety of *privata*. In general, Polillo agrees as to its gryllacrid fauna with Luzon more than with any other island.

VENATIONAL TYPE IV [19]

Gryllacris maculipennis Stål.

Gryllacris maculipennis STÅL, Oefv. Vet.-Akad. Förh. No. 10 34 (1877) 47; BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien 38 (1888) 348; KIRBY, Syn. Cat. Orth. 2 (1906) 143; GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 78; Rev. Suisse Zool. No. 2 17 (1909) 390 (*masculipennis*); Atti Soc. It. Sci. Nat. 49 (1910) 14; Boll. Mus. Zool. Anat. Torino No. 668 28 (1913) 5; Philip. Journ. Sci. § D 10 (1915) 63, 67; BRUNER, UNIV. of Nebraska Stud. Lincoln No. 2 15 (1915) 268; GRIFFINI, Mon. Zool. It. No. 2 29 (1918) 23.

Gryllacris maculipennis laticauda subsp. nov. Plate 1, fig. 8.

Female.—Larger than *maculipennis* and *maculipennis bakeri*. Fastigia without ocellar spots. Longitudinal sulcus of pronotum visible, but not very much impressed. Tegminal venation of the usual type IV. With three or four precostals, the last of these not reaching fore margin, but close before it ending in a bluntly rounded angle at a cross vein which connects it with costal vein. Costa and subcosta simple; the latter strongly approximated to radius a little before end, then diverging from it again. Radial vein two-branched or three-branched. Radial sector arising a little before the middle of tegmen, two-branched or three-branched. Medial vein arising from radius basad of radial sector, simple throughout. Cubitus not united at base with radial stem, simply forked before middle. Anals five, simple. The metallic blue basal spot very large, 15 millimeters long, reaching in length from base of tegmen to first cross vein behind

[19] Treubia 5, Livr. 1–3 (1924) 51, 71.

end of last precostal, in width from fore margin to radial stem; along fore margin only a very narrow stripe at base, before first precostal, yellowish hyaline; in precostal area all cross veins of the same metallic blue as the spot; behind costa the cross veins ferruginous and surrounded by the same color; in this manner the large spot is interrupted in this portion by yellowish. The dark spots in distal part of tegmen arranged as in *bakeri*, with a metallic blue gleam. Hind wings practically as in *maculipennis* and *maculipennis bakeri*. Legs as in the typical species, but hind tibiæ on each side with seven spines. Ovipositor of a shape unusual in this genus; well compressed, widest about in middle, blunt at tip. Female subgenital plate (Plate 4, fig. 11) almost pentagonal, blunt, and slightly emarginated at apex. Preceding sternite produced distad into two obtuse angles, broadly emarginated between them.

Measurements of Gryllacris maculipennis laticauda sp. nov.

Length.	Female. mm.
Body	39
Pronotum	7.5
Tegmina	30.2
Fore femora	14
Hind femora	22.3
Ovipositor	19.8

One female from northwestern Panay (*Baker*).

By the absent ocellar spots, the coloration of tegmina, and the shape of female subgenital plate nearer to *maculipennis bakeri* than to the typical *maculipennis*, differing from both by its considerably larger size and the unusual shape of the ovipositor.

Gryllacris maculipennis specularis subsp. nov.

Male.—Smaller than typical *maculipennis*, of a paler, tawny yellow tinge. Ocellar spots present as in typical *maculipennis* (Griffini, 1909); the lower one very well defined, in shape and size quite as in *podocausta*, but not surpassing upward the suture between frontal fastigium and vertex. Labrum dark ferruginous, except at base where it is pale yellowish. Basal antennal joints also pale yellowish. The two black dots at antennal scrobes present, as in *maculipennis*. Pronotum pale, tawny, without darker spots; longitudinal sulcus more distinct than in *laticauda*. Tegminal venation (Plate 8, fig. 4) practically as in *laticauda*, but radial sector arising about at end of second third of tegminal length. Medial vein (on both tegmina) doubled,

namely, two separated, simple branches arising from radial stem basad of radial sector. This arrangement reminds one at first view of the venation of *G. lineolata*,[20] but is quite different from it in a morphological sense, as in *specularis* both branches represent the medial vein, whereas in *lineolata* the first one is the cubitus, the second only the media. In *specularis*, there is behind it a free cubitus, arising from tegminal base, forked before middle, on right tegmen both branches remaining simple, on left one the fore branch being forked again. Anals five, the last two arising from a relatively long common stem. The large metallic blue basal spot smaller than in *laticauda*, 6 millimeters long, beginning at second cross vein between last precostal and costal vein, otherwise extended about as in *laticauda*. Between fore margin and last precostal the cross veins whitish hyaline and surrounded by the same color: the blue spot, therefore, does not reach to fore margin, as in *laticauda;* cross veins between last precostal and costal vein only of the same blue color, behind costa as in *laticauda*. The distal spots arranged as in that species, but somewhat less dark. Hind wings as in *maculipennis*. Legs as in the typical species. Hind femora with nine or ten spines on outer margin, eight or nine on inner. Hind tibiæ with six spines on inner edge, six or seven on outer. End of male abdomen (Plate 4, fig. 10) practically as in *maculipennis* (Griffini, 1909, p. 80) ; the spines of ninth tergite directed downward at base, then strongly curved upward and crossed with another in this ascending part.

Measurements of Gryllacris maculipennis specularis subsp. nov.

Length.	Male. mm.
Body	21.2
Pronotum	5
Tegmina	21
Fore femora	9
Hind femora	14

One male from Mount Maquiling, Luzon (*Baker*).

Coming nearest to typical *maculipennis*, differing from it by the considerably smaller size and the smaller basal spot of tegmina. The doubled media may perhaps also be a character of importance, but this is not yet certain, as only one specimen of *specularis* is known, and of *maculipennis* and *bakeri* the venation is not yet described. From *bakeri* and *laticauda* it differs by the same characters as does typical *maculipennis*.

[20] Treubia 5, Livr. 1–3 (1924) 91, fig. 30.

Gryllacris nasalis Walker.

Gryllacris nasalis WALKER, Cat. Derm. Salt. Brit. Mus. 1 (1869) 183; STÅL, Oefv. Vet.-Akad. Förh. No. 10 34 (1877) 47 (*biguttata*); BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien 38 (1888) 346 (*biguttata*); KIRBY, Syn. Cat. Orth. 2 (1906) 141 (*nasalis*), 143 (*biguttata*); GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 74 (*biguttata*); Rev. Suisse Zool. No. 2 17 (1909) 390 (*biguttata*); Atti Soc. It. Sci. Nat. 49 (1910) 14 (*biguttata*); Wien. Ent. Zeit. No. 10 32 (1913) 239 (*biguttata*); Philip. Journ. Sci. § D 10 (1915) 64, 68; BRUNER, UNIV. of Nebraska Stud. Lincoln No. 2 15 (1915) 267 (*nasalis*), 268 (*biguttata*).

Gryllacris nasalis sibuyana subsp. nov. Plate 1, fig. 4.

Female.—Differing from the typical species by the following characters (after Griffini's description, 1909): Pronotum shining black, bordered with tawny brown, the pale margin about 1 millimeter wide. Disk not paler than lateral humps. Tegmina, especially in anterior distal portion, with some dark spots in the centers of the cells. The dark bands of hind wings more than twice as wide as the pale stripes between them. Tibiæ not darkened, their spines of equal size on inner and outer margin, not darker before the tips. Hind femora with six to eight spines on both margins. Hind tibiæ six-spined on both margins.

As Griffini says nothing of venation, I add that it is arranged according to the usual type IV. Costal vein simple; subcosta simply forked before apex; radial vein three-branched; radial sector arising close before the middle of tegmen, three-branched; media arising from radial stem about at end of first third of tegminal length, simple; cubital vein three-branched (anterior branch forked again, hind branch simple); anals six, simple. Base of hind wings as figured for *fuscifrons*.[21]

Measurements of Gryllacris nasalis sibuyana subsp. nov.

Length.	Female. mm.
Body	36.5
Pronotum	8.2
Tegmina	34.2
Fore femora	11.2
Hind femora	19.7
Ovipositor	12.5

One female from Sibuyan (*Baker*).

Differing from the typical species by the black disk of pronotum, by the larger extent of fuscous color on hind wings (com-

[21] Treubia 5 (1924) 55, fig. 23.

pare Griffini's figure, 1915, with that given here on Plate 1, fig. 4), and by the somewhat shorter ovipositor. By the coloration of pronotum, it runs to Griffini's key of the "hyalino-fasciatae" (1910) to group H (*moestissima* and *loriae*), while differing from this group by the color of head, which agrees with *nasalis*. This is a fact of zoögeographical importance, as the typical *nasalis* is known from Luzon (Manila), while *sibuyana*, originating from the more southerly situated island Sibuyan, resembles somewhat the Moluccan *moestissima*.

Gryllacris nasalis var. detersa Griffini.

Gryllacris nasalis var. *detersa* GRIFFINI, Wien. Ent. Zeit. 32 (1913) 241 (*biguttata* var. *detersa*); BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 268 (*biguttata* var. *detersa*); GRIFFINI, Philip. Journ. Sci. § D 10 (1915) 64, 68; Mon. Zool. It. No. 2 29 (1918) 24.

One female from Los Baños (*Baker*) agrees perfectly with Griffini's description of this variety (male, 1913; female, 1918). Tegminal venation practically as described for *sibuyana;* radial sector three-branched or four-branched; cubital vein simply forked before middle (on both tegmina). The gray spots on hind wings rather pale. Hind femora with seven spines on outer, five or six on inner margin; hind tibiæ with six spines on outer, five or six on inner margin.

Measurements of Gryllacris nasalis var. detersa Griffini.

Length.	Female. mm.
Body	26.5
Pronotum	6.5
Tegmina	26
Fore femora	9.3
Hind femora	15.4
Ovipositor	11.8

Gryllacris pustulata Stål.

Gryllacris pustulata STÅL, Oefv. Vet.-Akad. Förh. No. 10 34 (1877) 47; KIRBY, Syn. Cat. Orth. 2 (1906) 145; GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 82; Ann. Mus. Nat. Hungar. 11 (1913) 292; Philip. Journ. Sci. § D 10 (1915) 63, 66; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 268; GRIFFINI, Mon. Zool. It. No. 2 29 (1918) 24.

Key to the subspecies of Gryllacris pustulata Stål.

a^1. Head, pronotum and legs ferruginous.

b^1. Inferior ocellar spot small and not very distinct..... G. pustulata Stål.

b^2. Inferior ocellar spot large, occupying almost the whole frontal fastigium..... G. p. ocellaris subsp. nov.

a^2. Head, pronotum, and legs in large part blackish.

b^1. Head black, the occiput and a part of genæ only castaneous. Pronotum black, lateral humps castaneous. Fore femora black beneath and above, castaneous at sides. All tibiæ blackish.

G. p. mindorensis Griffini.

b^2. Occiput, hind part of genæ, vertex, frontal fastigium, and a frontal spot testaceous; mouth parts (except palpi) and forehead black. Pronotum testaceous, black bordered. Legs testaceous, knees black; fore tibiæ, apex of middle and hind tibiæ, and all tarsi dark brown.

G. p. luzoniana Griffini.

Gryllacris pustulata ocellaris subsp. nov.

Female.—Very near to typical *pustulata*, from which it differs by the following characters: Inferior ocellar spot large, yellow, not very well defined, occupying almost the whole frontal fastigium. Clypeus somewhat paler than forehead, yellowish. Antennæ not darker at base. Cross veins in distal part of tegmina somewhat darkened, but not conspicuously bordered with dark; those in anterior part of hind wings distinctly bordered with blackish. Remaining part of hind wings grayish, all cross veins distinctly blackish bordered, within all areas a large whitish hyaline spot, also in basal and marginal areas! These spots are circular behind middle, becoming elliptical in middle of hind wings, then basad still more elongate, finally in basal areas occurring as very narrow, radiate stripes; but present everywhere, not in the middle wing part only, as noted by Griffini for *pustulata* (typ.). Hind femora on each margin with seven to nine spines; spines of hind tibiæ six or seven on outer edge.

Tegminal venation not yet known for *pustulata*. In the specimen before me it agrees with type IV, practically as in the preceding species: subcosta and radial vein simply forked, radial sector three-branched, media simple, cubital vein simply forked before middle; anals five, on left tegmen the last two arising from a very short common stem, on right tegmen the last (fifth) anal simply forked about in the middle of its length. Hind wings as usual in type IV.

Measurements of Gryllacris pustulata ocellaris subsp. nov.

Length.	Female. mm.
Body	28.5
Pronotum	8.8
Tegmina	32
Fore femora	10.8
Hind femora	19.4
Ovipositor	19.5

One female from Samar (*Baker*).

Resembles *nigrilabris* as to coloration of hind wings, differing from it by the somewhat smaller size, the shorter ovipositor, and the pale labrum. Also very similar to *obscura*, especially its var. *javanica*. Comparing *ocellaris* and *javanica*, the specimen mentioned in Treubia 5 (1924) 81, I found a considerable difference in the shape of clypeus and labrum, which in *obscura javanica* (Plate 10, fig. 7) are wide and very short, in *pustulata ocellaris* slender and much longer (Plate 10, fig. 4), practically as in *nigrilabris* (Plate 10, fig. 5). The specimen recorded in Treubia 5 (1924) 233, which I would now place rather in *obscura*, also has clypeus and labrum very wide and short (Plate 10, fig. 6), although not as much so as in *javanica*. As I had before me only a male of each of the latter, and of *pustulata ocellaris* and *nigrilabris* only females, I at first thought that this difference might perhaps be merely a sexual character; but on comparing extensive Javanese material of both sexes of *fuscifrons* and *signifera*, I found that in all of them the shape of the clypeus and the labrum is practically the same as in *pustulata ocellaris* and *nigrilabris*. I expect therefore it will prove a character of specific importance, as there is no sexual difference in the two Javanese species.

The following species of venational type IV are not from the Philippine Islands.

Gryllacris nigrilabis Gerstäcker.

Gryllacris nigrilabris GERSTÄCKER, Arch. f. Nat. 26 (1860) 262; KARNY, Treubia 5 Livr. 1–3 (1924) 81 (with list of literature).

One female from Sandakan, Borneo (*Baker*). Labrum black (Plate 10, fig. 5).

Measurements of Gryllacris nigrilabris Gerstäcker.

Length.	Female. mm.
Body	38.7
Pronotum	8.8
Tegmina	36.5
Fore femora	13.5
Hind femora	23.7
Ovipositor	29

Venation as described in Treubia. Radial sector two-branched or three-branched.

Gryllacris discoidalis subsp. atropicta Griffini.

Gryllacris discoidalis subsp. *atropicta* KARNY, Journ. R. As. Soc. Mal. Br. No. 87 1 (1923) 124 (with list of literature).

Venation practically as in the preceding species. Subcosta simply forked before apex; radial vein three-branched; radial sector five-branched; media simple; cubitus simply forked before the middle; anals five, simple. Female subgenital plate very elongate, much longer than wide, excised at apex, much longer and narrower than in all allied species, namely: 4.2 millimeters long; 3.5 wide at base, 1.5 in the middle, 1.2 at apex.

One female from Singapore (*Baker*).

I place in the same species a male larva from the same locality, with black hind wing cases, as in *signifera*.[22]

Gryllacris maculata var. nobilis Walker. Plate 1, fig. 1.

Gryllacris maculata var. *nobilis* KARNY, Journ. R. As. Soc. Mal. Br. No. 87 1 (1923) 126 (with list of literature).

One female from Singapore (*Baker*) without darker spots in distal part of tegmina. The specimen is a small one and agrees rather with the measurements given by Brunner, 1888, and by Griffini, 1914; tegmina (31.4 millimeters long) and ovipositor (29 millimeters) still shorter. The specimens in Raffles Museum (Karny, 1923) are considerably larger, about the same size as the males recorded by Griffini, 1909 (length of body up to 40 millimeters), the ovipositor 32.7 millimeters long. Otherwise they are not different from the female of Baker's collection, except in the presence of many dark spots on tegmina.

[22] Treubia 5 (1924) pl. 2, fig. 5.

ILLUSTRATIONS

Plate 1

Fig. 1. *Gryllacris maculata nobilis* Walker, × 5/6; del. Mas Siswo Amidjojo.
2. *Gryllacris siderea* sp. nov., × 5/6; del. Soehanam.
3. *Gryllacris brachyptera* Gerstäcker, × 5/6; del. Mas Siswo Amidjojo.
4. *Gryllacris nasalis sibuyana* subsp. nov., × 5/6; del. Raden Soedirman Atmosaprodjo.
5. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, × 5/4; del. Soehanam.
6. *Gryllacris recticauda* sp. nov., × 5/6; del. Mas Siswo Amidjojo.
7. *Gryllacris fuscinervis panayensis* var. nov., × 5/6; del. Mas Siswo Amidjojo.
8. *Gryllacris maculipennis laticauda* subsp. nov., × 5/6; del. Raden Soedirman Atmosaprodjo.

Plate 2

Fig. 1. *Gryllacris pictipes* sp. nov., male, lateral view, natural size; del. Soedirman.
2. *Gryllacris pictipes* sp. nov., head and pronotum, dorsal view. × 2; del. Soedirman.
3. *Gryllacris arctata* Walker, tegmen.
4. *Gryllacris arctatiformis* sp. nov., tegmen.
5. *Gryllacris recticauda* sp. nov., tegmen.

Plate 3

Fig. 1. *Gryllacris pictipes* sp. nov., tegmen.
2. *Gryllacris arctata* Walker, female, subgenital plate.
3. *Gryllacris arctata* Walker, male, end of adbomen, posterior aspect.
4. *Gryllacris arctatiformis* sp. nov., female, subgenital plate.
5. *Gryllacris plebeia* (typica) Stål, male, subgenital plate.
6. *Gryllacris plebeia immaculata*, male, subgenital plate.
7. *Gryllacris plebeia connexa* subsp. nov., male, subgenital plate.
8. *Gryllacris brachyptera brevisector* subsp. nov., male, subgenital plate.
9. *Gryllacris melanosticta* sp. nov., male, subgenital plate.
10. *Gryllacris samarita* sp. nov., male, subgenital plate.
11. *Gryllacris modesta* sp. nov., male, subgenital plate.
12. *Gryllacris emarginata* sp. nov., female, subgenital plate.
13. *Gryllacris privata* sp. nov., female, subgenital plate.
14. *Gryllacris sectoralis* sp. nov., female, subgenital plate.

PLATE 4

FIG. 1. *Gryllacris arctatiformis* sp. nov., hind femur. Figures 1 to 6 are drawn to the same scale.
2. *Gryllacris arctata* Walker, hind femur.
3. *Gryllacris arctatiformis* sp. nov., pronotum, lateral view.
4. *Gryllacris arctata* Walker, pronotum, lateral view.
5. *Gryllacris arctatiformis* sp. nov., fore tibia.
6. *Gryllacris arctata* Walker, fore tibia.
7. *Gryllacris siderea* sp. nov., hind femur.
8. *Gryllacris siderea* sp. nov., male, end of abdomen, posterior view.
9. *Gryllacris siderea* sp. nov., male, end of abdomen, ventral view.
10. *Gryllacris maculipennis* subsp. *specularis* subsp. nov., male, end of abdomen, ventral view.
11. *Gryllacris maculipennis* subsp. *laticauda* subsp. nov., female, end of abdomen, ventral view.
12. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, male, end of abdomen, posterior view.
13. *Gryllacris pictipes* sp. nov., male, end of abdomen. The bristle hairs of cerci, styles, and subgenital plate are not figured.

PLATE 5

FIG. 1. *Gryllacris melanosticta* sp. nov., tegmen.
2. *Gryllacris melanosticta* sp. nov., tegmen.
3. *Gryllacris samarita* sp. nov., tegmen.

PLATE 6

FIG. 1. *Gryllacris fuscinervis panayensis* var. nov., male, tegmen.
2. *Gryllacris fuscinervis panayensis* var. nov., female, tegmen.
3. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, male, tegmen.
4. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, female, tegmen.

PLATE 7

FIG. 1. *Gryllacris nigrogeniculata tristis* subsp. nov., tegmen.
2. *Gryllacris nigrogeniculata tristis* subsp., nov., tegmen.
3. *Gryllacris brachyptera brevisector* subsp. nov., tegmen.
4. *Gryllacris brachyptera brevisector* subsp. nov., tegmen.

PLATE 8

FIG. 1. *Gryllacris brachyptera* Gerstäcker, tegmen.
2. *Gryllacris brachyptera* Gerstäcker, tegmen.
3. *Gryllacris brachyptera* Gerstäcker, fore part of hind wing.
4. *Gryllacris maculipennis specularis* subsp. nov., tegmen.

PLATE 9

FIG. 1. *Gryllacris plebeia* (typica) Stål, male, tegmen.
2. *Gryllacris plebeia* (typica) Stål, male, tegmen.
3. *Gryllacris plebeia connexa* subsp. nov., male, tegmen.
4. *Gryllacris plebeia connexa* subsp. nov., male, tegmen.

PLATE 10

FIG. 1. *Gryllacris plebeia* subsp. *immaculata* Griffini, tegmen of a male from Los Baños.

2. *Gryllacris plebeia* subsp. *immaculata* Griffini, tegmen of a female from Mount Maquiling.

3. *Gryllacris plebeia* subsp. *immaculata* Griffini, tegmen of a female from Polillo Island.

4. *Gryllacris pustulata ocellaris* subsp. nov., female, clypeus and labrum.

5. *Gryllacris nigrilabris* Gerstäcker, female, clypeus and labrum.

6. *Gryllacris obscura* ? Brunner v. Wattenwyl, male, clypeus and labrum. Specimen from Tambang Sawah (Benkulen), recorded in Treubia 5 Livr. 1–3 (1924) 233.

7. *Gryllacris obscura javanica* Griffini, male, clypeus and labrum.

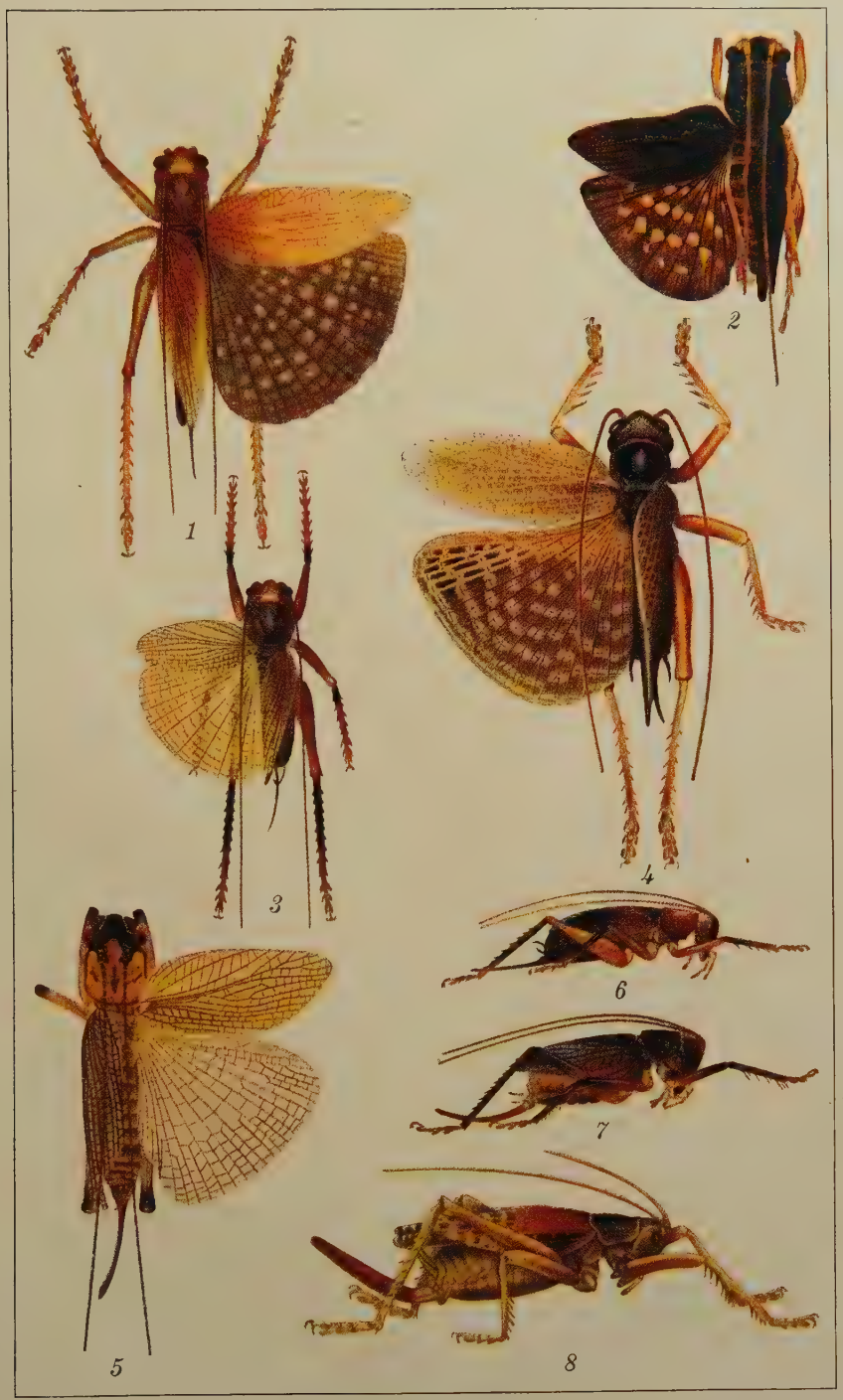


PLATE 1.

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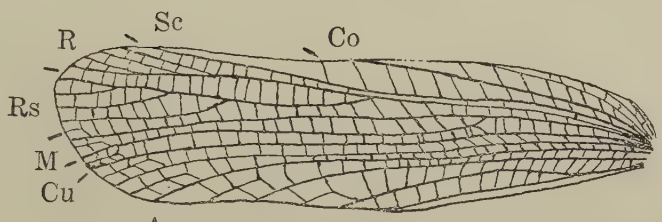

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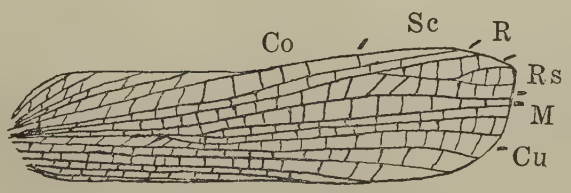

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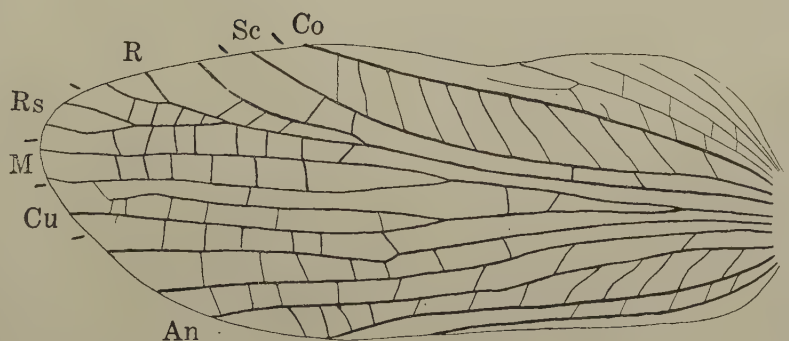

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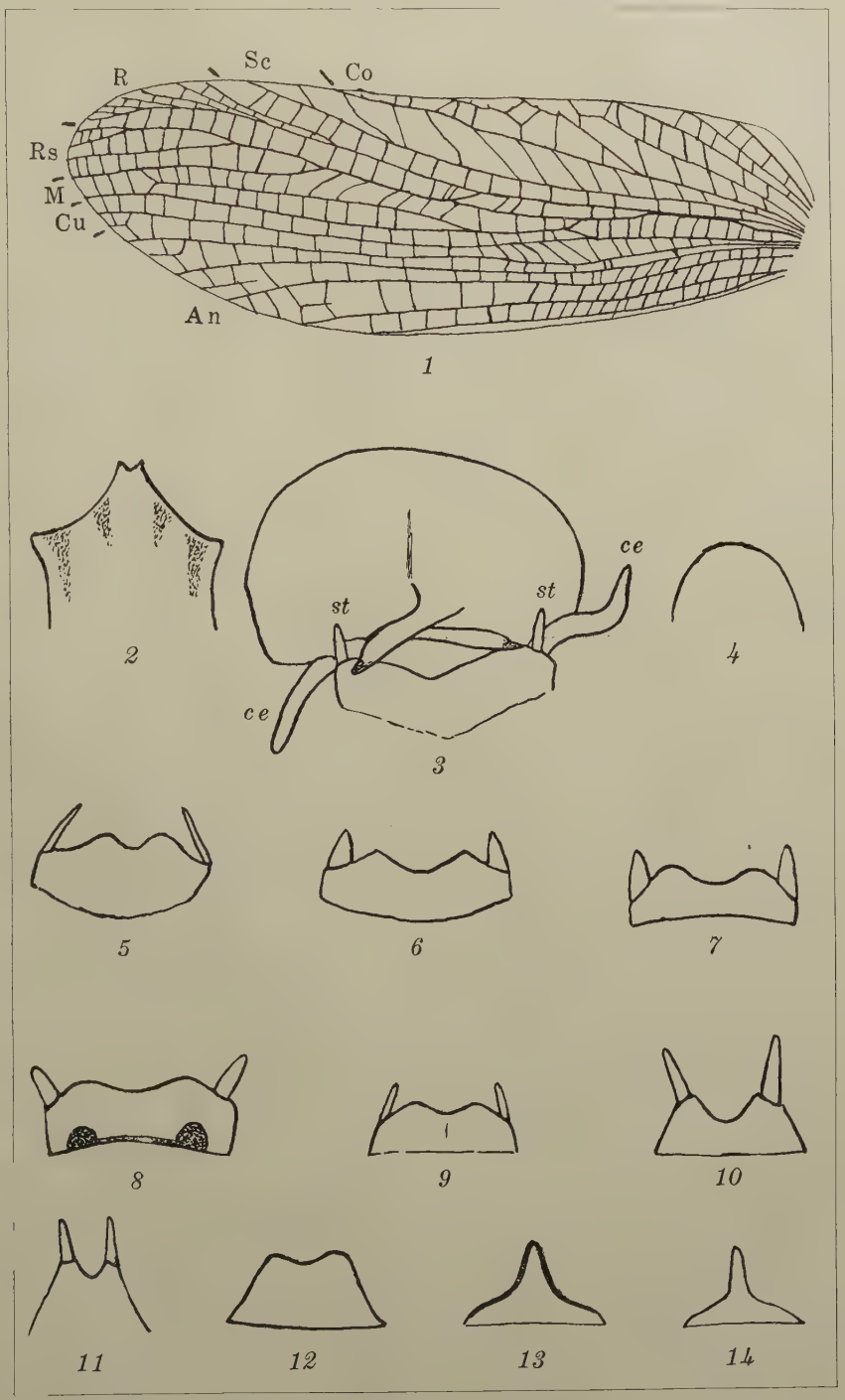

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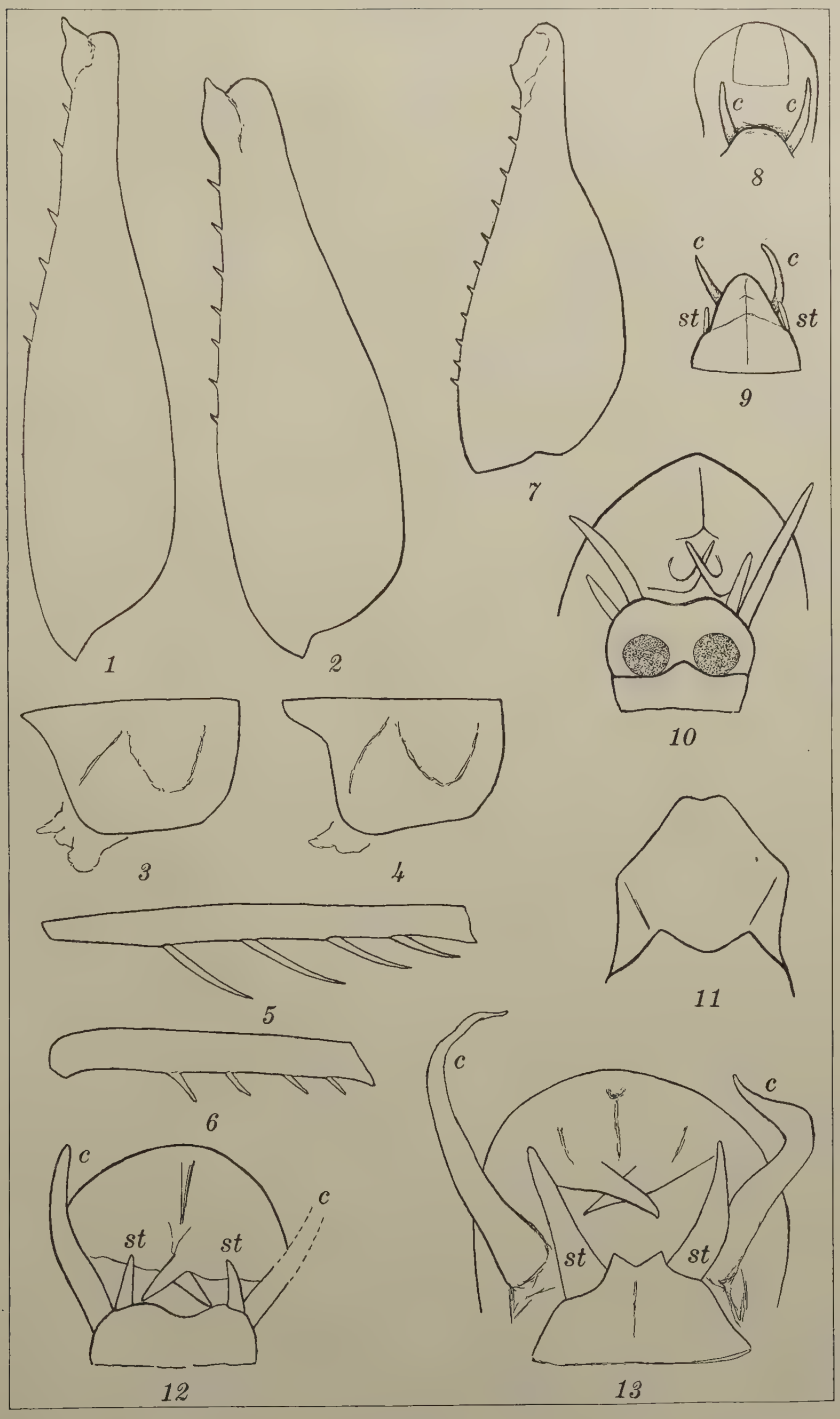

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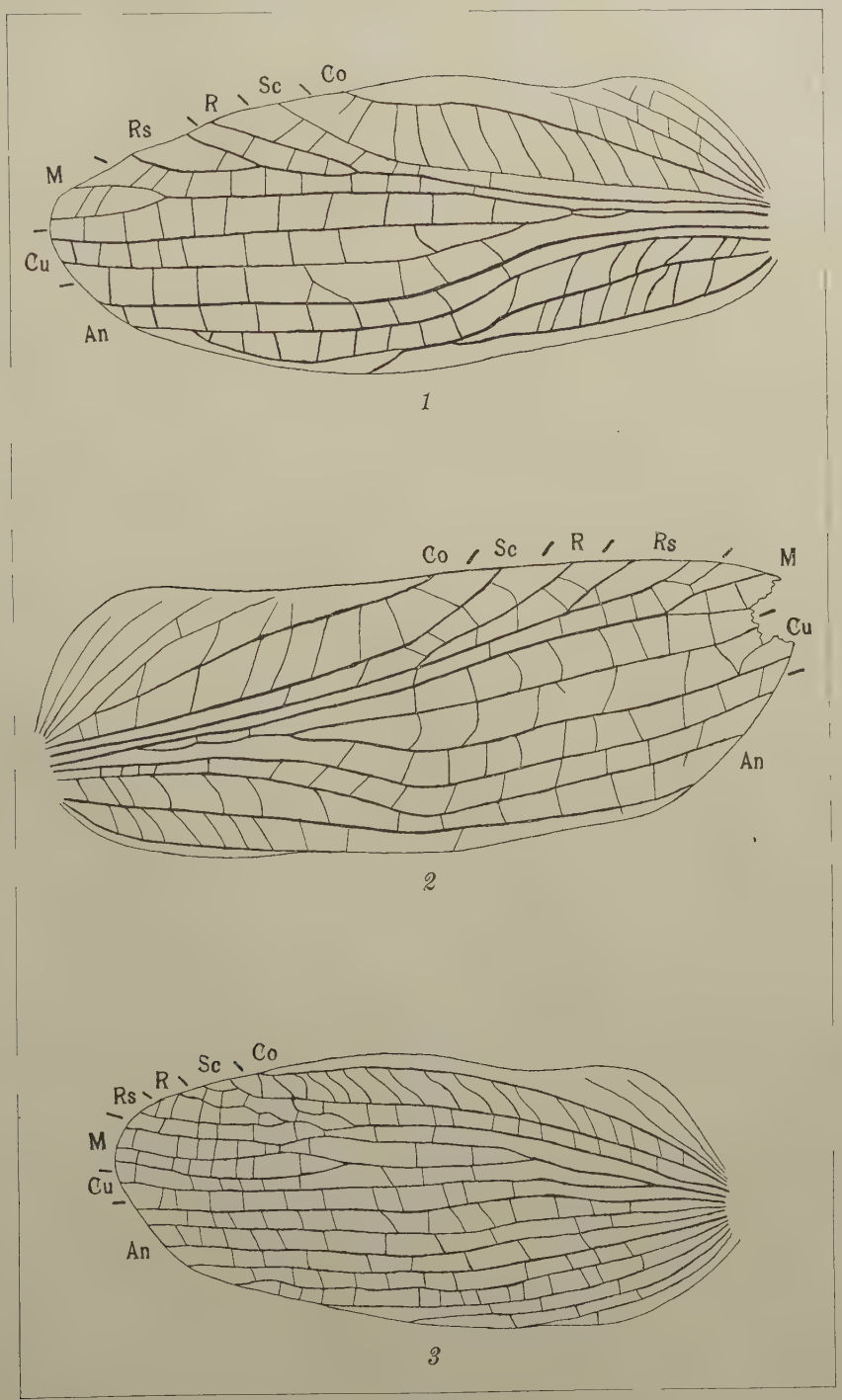

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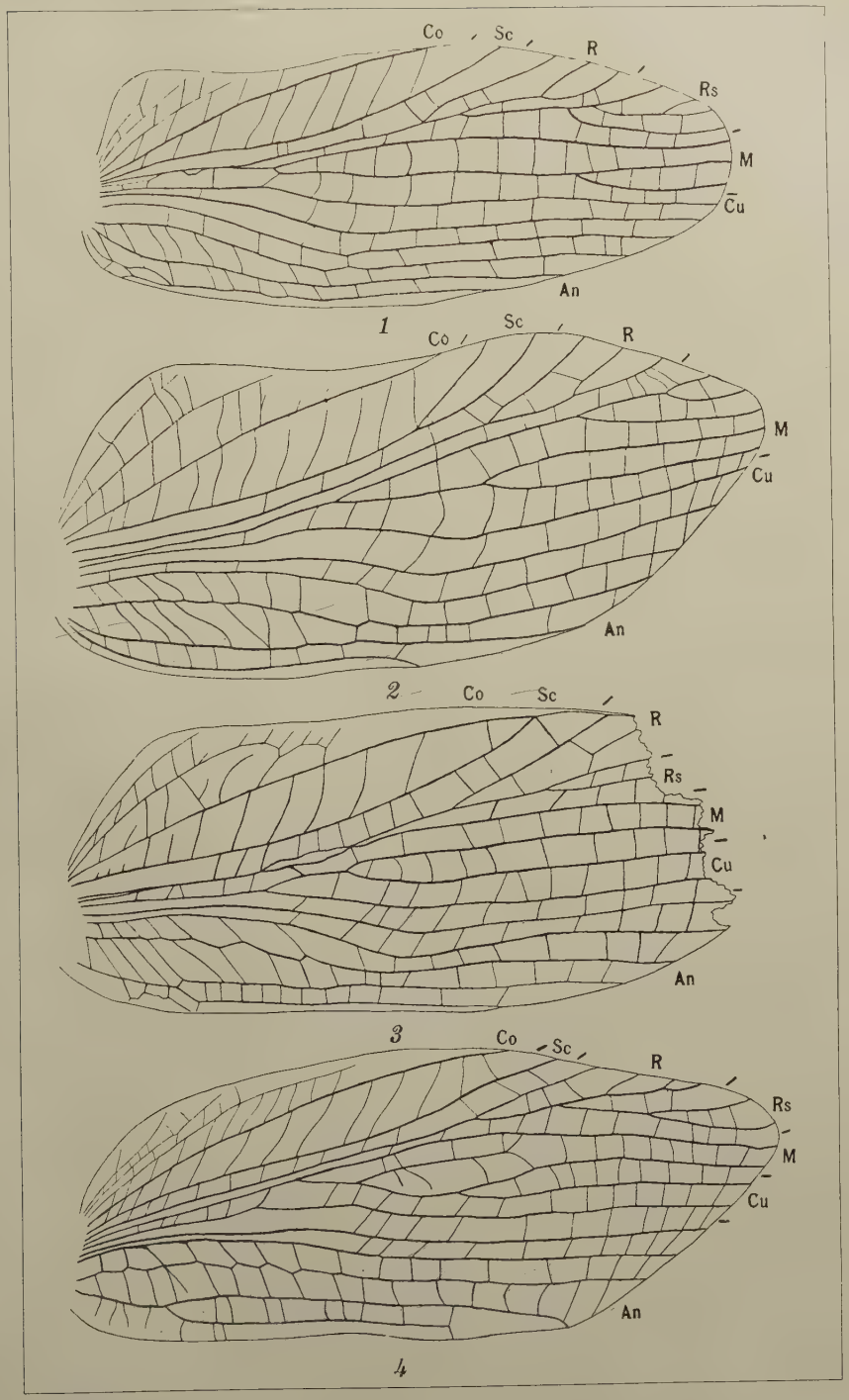
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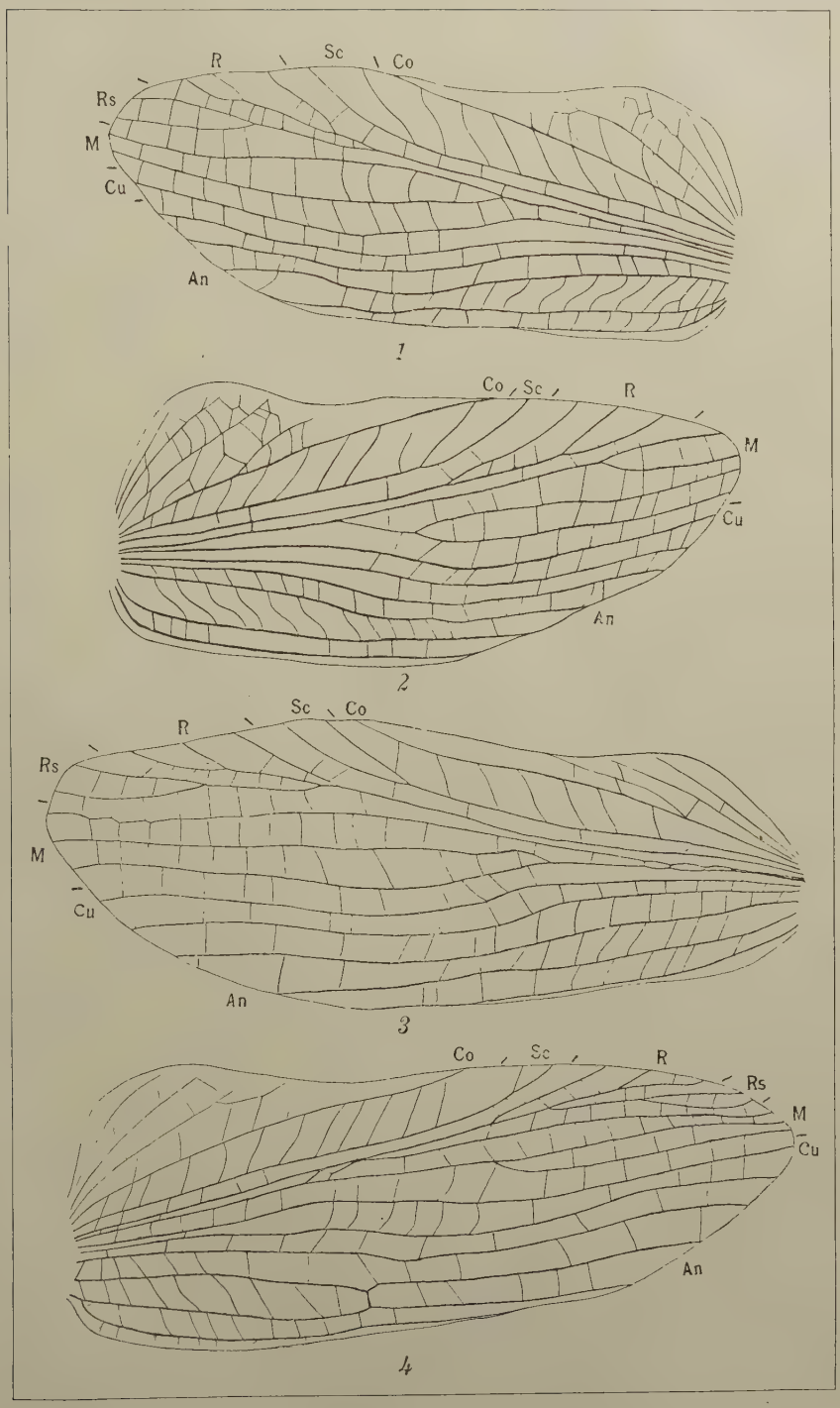
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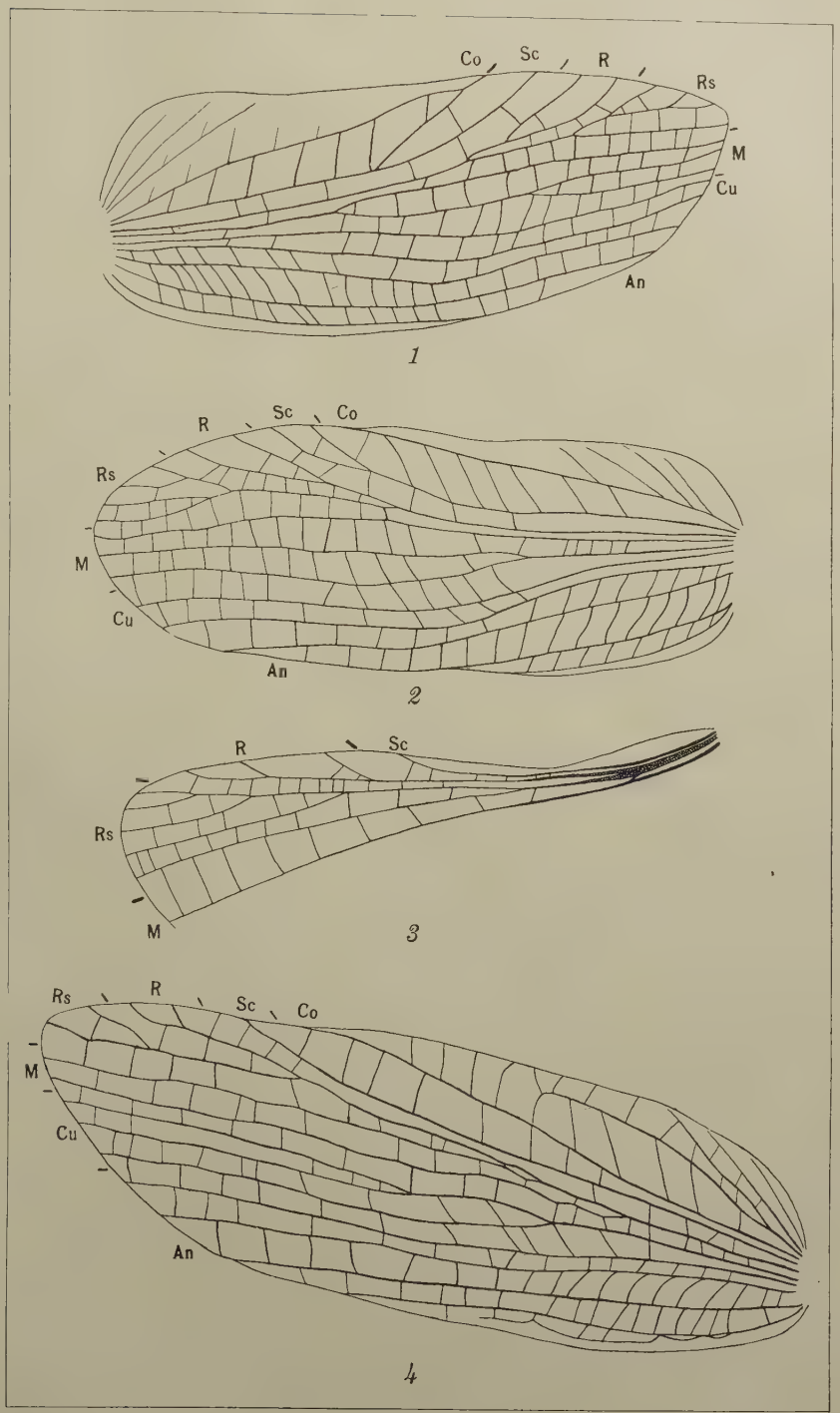

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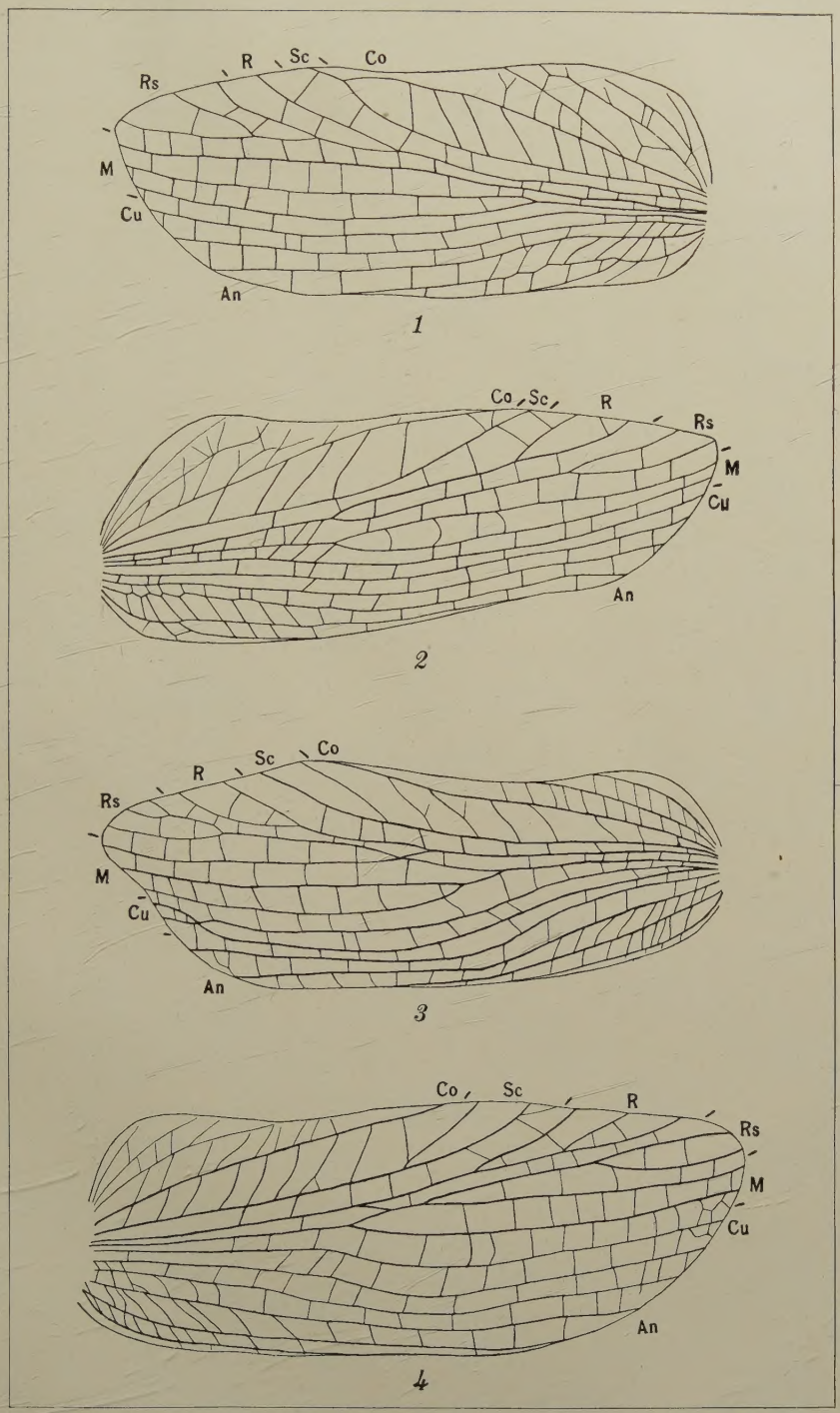
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PLATE 9.

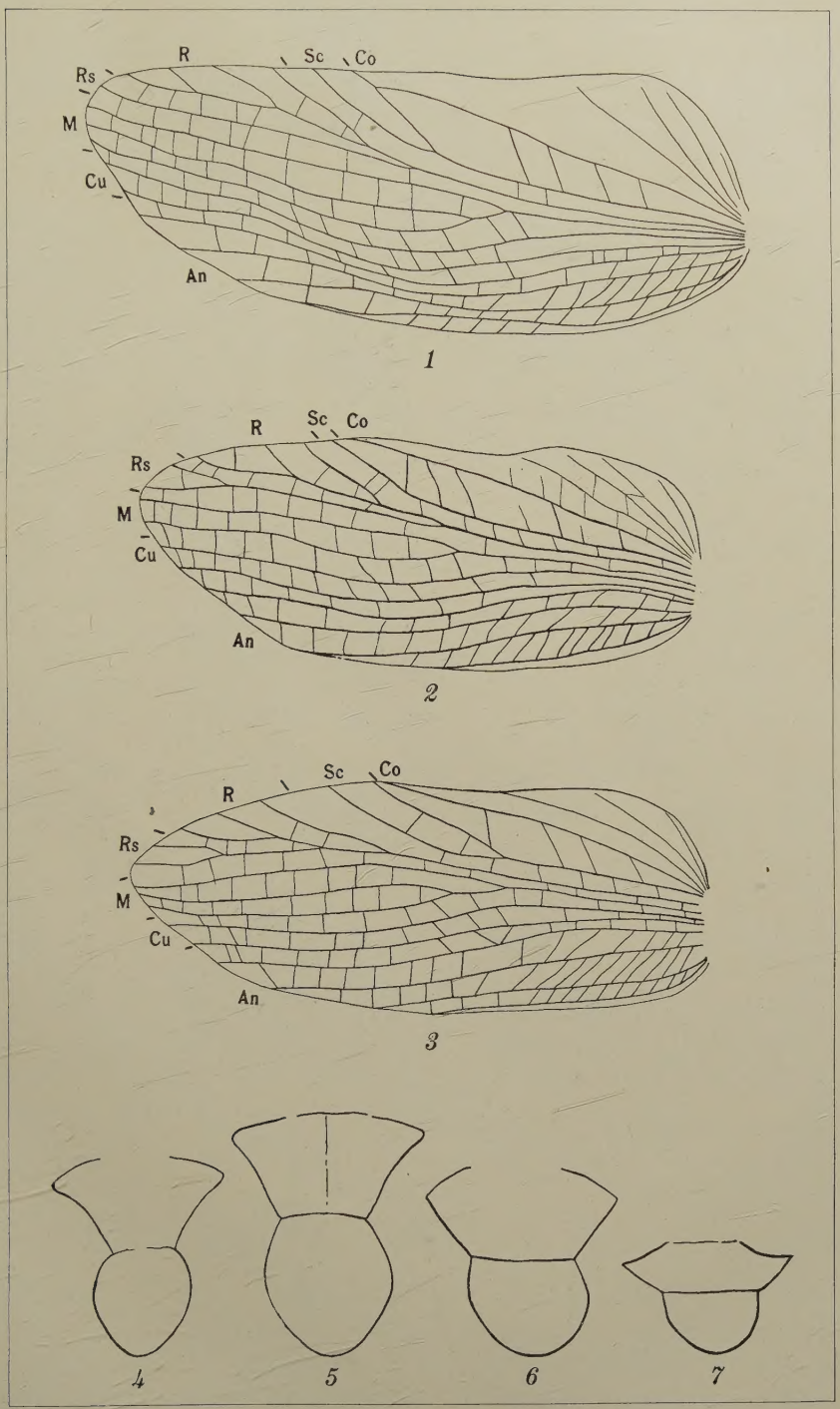

PLATE 10.